

NAGS HEAD

LAND USE PLAN UPDATE FOR

THE TOWN OF NAGS HEAD

1980 - 1990

Prepared for the Town by

COASTAL CONSULTANTS, LTD.

November 1980

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## INTRODUCTION

This Land Use Plan is designed to deal with problems anticipated during the next ten years; hence, the description 1980-1990 Land Use Plan for Town of Nags Head.

The Plan is organized into four parts: Section One consists of the principal part of the Plan, its policy and decision element. This is the heart of the plan and is condensed in an essay format to allow easy reading by the public. The perspective is that of the Town of Nags Head. For the sake of brevity, the words "Town" and "Nags Head" are used extensively throughout the Land Use Plan. Unless otherwise indicated by the context, the words "Town" and "Nags Head" as used throughout mean and refer to the Board of Commissioners as the governing body of the Town of Nags Head. The internal format of this section follows a general format of policy on a particular subject area, alternatives considered, and means of implementation. In some instances alternatives were not discussed. Most of these situations resulted from only a no policy alternative being considered. A general discussion of implementation follows at the end of the section. Section Two consists of Technical Reports which provide some of the information considered by the Town in its formulation of policy in Section One. These papers were written from the point of view of the consultants to the projects, namely Coastal Consultants, Ltd. Some of the attitudes and conclusions of the consultants were rejected or tempered in the formulation of policy. This is a natural occurrence

and reflects merely a difference of opinion as to a proper course. The Town is not aware of any substantial inconsistencies between policy and evidence towards the policy.

Section Three includes a description of existing plans, policies and regulations of the Town, especially policies from the 1976 Land Use Plan.

Section Four contains the Planning Element used for public participation and a list of federal and state permits.

References are provided in Section One to allow the reader to find support material in other sections. References are to chapter headings (see top right corner of page) and page number.

SECTION ONE: LAND USE PLAN: POLICIES.

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## TEN YEAR PLAN (LAND USE PLAN, 1980-1990)

Nags Head prides itself as a family beach resort community on the Outer Banks of North Carolina. Located within a short driving distance of the Norfolk, Virginia area and a longer driving distance to the Washington, D.C. and Piedmont, North Carolina areas, the Town boasts of broad metropolitan appeal. The population of the Town, which is less than 1500 during the winter season, swells to nearly 13,000 people during the summer months (Population, p. 12).

Nags Head is primarily an ocean oriented community. It has the largest percentage of persons staying overnight in motels of any community on the northern Outer Banks. The Town is fortunate to have significant natural resources, including the ocean and its beaches, the Sound, the complex natural area called the Nags Head Woods (which consists of stable, productive marshland, fresh water ponds and steep migrating and stabilized dunes) and unique geological features like Jockey's Ridge.

Nags Head is growing at a rate of approximately 8% per year (Population, p. 12). The Town has escaped the strip commercial development prevalent to the north. It has a strong tax base and one extremely large tract, extending from ocean to sound, of undeveloped land. Given current growth rates and the protection of natural features, the Town should be 50% developed by 1990 (Carrying Capacity, p. 10). Given the Town's desire to pursue a low density growth pattern some redevelopment seems likely.



## Growth

Nags Head anticipates that if recent growth trends continue the average summer population of the Town in 1990 will be between 30,000 to 35,000 people (Population, p. 12). This population is more than double the 13,500 people who stayed overnight in lodging in the Town in 1979 (Population, p. 12). The difficulty with the growth projection in Nags Head is understanding what trends are likely to result from the motels and cottage courts reaching and exceeding capacity, something that appears to have occurred in the late 70's (See new housing start data, Population, p. 12). In Kill Devil Hills a similar phenomena has resulted in an increased rate of new building starts for single family structures; recently at a rate in excess of 200 per year (See Kill Devil Hills Land Use Plan).

Nags Head contends that many factors could affect the growth rate. These include the stimulation of the rate from the rapid introduction of a large number of new developable lots into the marketplace, the introduction of new forms of housing types into the marketplace, and the possible redevelopment of the oceanfront with new motels. On the other hand the rate of growth could decrease in the event that high interest rates and tight money necessary for construction and home building continue, or if a severe energy crisis should reoccur (See new housing start data). Nags Head should realize the subdivision of the largest undeveloped tract within the Town's jurisdiction within the next ten years. Furthermore, an apparently strong desire for condominium housing may stimulate the market. During the recession years of the early 70's the Town's growth rate was nearly stopped. These short periods tend to be overshadowed by even stronger growth rates following

the lifting of the frustration. Nags Head's population does not appear very sensitive to the costs of fuel; it may respond, however, to the lack of availability (Recreation, p. 1, also, see data in Town Planning Department on building starts and water sales, 1968 to present).

The western boundaries of Nags Head are directly or indirectly connected to the estuarine systems of the Roanoke and Albemarle Sounds. A large portion of the soundside is marshland (See map of marshland). Since much of the future population of Nags Head will settle in areas west of the bypass (Population, pp. 12-14), the Town is concerned with the effects that such development may have on the Sound. Salinity of the Sound in areas adjacent to Nags Head and its vicinity is most suitable to shellfishing; [currently these areas are closed to shellfishing] (Environmental Considerations, p. 9-12). Furthermore, marshlands in the Woods are extremely productive and valuable areas for plant and animal life (See report on Nags Head Woods). The major fear from development is contamination from septic systems. Septic systems installed on poor soils close to the sounds are generally acknowledged to be responsible for polluting estuarine systems (Environmental Considerations, p. 12).

Although the Town considered limiting growth to only so much as could be accommodated on good soils and without the construction of a public sewer system, the Town rejected that policy. The Town allows but does not encourage the construction of large motels to meet the [1] demands for future growth. It is the Town's policy that the anticipated growth to the year 1990 is welcomed and that the Town will plan to provide adequate services necessary to meet the demands of that population.

## Water and Sewer

In terms of the service needs for the 1990 population, the Town notes that it formerly relied on the Fresh Water Pond for its municipal water supply (Environmental Considerations, p. 8). During recent years elected officials and residents have been concerned with the repeatedly low water levels in the ponds following periods of heavy withdrawal. The Regional water system was anticipated to be in operation long before the 1980 summer season arrived (Environmental Considerations, p. 18.). With the advent of Regional water system in August 1980, the capacity of the water source is no longer a restriction on growth (Carrying Capacity, p. 4). The Regional system will make available to the Town sufficient water to accommodate the 1990 population, if the local water distribution system were capable of delivering it throughout the Town.

- [2] It is the Town policy that major improvements should be made to the water distribution system to allow it to deliver the water available from the Regional System and to accommodate expected growth to 1990.

The Town proposes to increase its water system's capacity to that of the Regional System by following the recommendations set out in the Engineering Study done by Williams and Works (1978); by building a 300,000 gallon ground reservoir at Whalebone Junction and by interdiciting the 24-inch transmission main at various points throughout the town.

Nags Head has historically developed on soils suitable for handling on-lot dewage disposal. Future development, however, is likely to occur on less suitable soils (Overlay soils map with developed areas). Now that public water is provided from the Regional System,

the fear of polluting the surficial aquifer (of which the Fresh Water Pond is a part) is diminished (Environmental Considerations, p. 16-17). However, the Town is concerned over the possibility of increasingly higher fecal coliform counts occurring in waters adjacent to its shores (Environmental Considerations, p. 16). The Sound is important to Nags

- [3] Head for commercial fishing and for recreational opportunities. The Town supports efforts to improve quality in the Sound. It is opposed to further deterioration in water quality of the Sound. The Town supports efforts initiated by the former Dare Beaches Water and Sewer Authority and its contractor, Henry Von Oesen & Associates, Consulting Engineers and Planners, to study the feasibility of a regional sewer system. The Town will study the feasibility of several package treatment systems to be located on future subdivisions which have a high percentage of unsuitable soils (See analysis of costs of different systems, Environmental Considerations, pp. 16).

- The Town will address its participation in a regional waste-water treatment system at a later time. In terms of installing a local collector system, the
- [4] Town will serve areas under the following scheme of priorities: areas with poor soils close to the Sound will be served first, then areas with poor soils, then heavily populated areas, then other areas. Nags Head places the lowest priority to extending public sewer mains to the environmentally sensitive Nags Head Woods, to wetland areas and other areas which are designed for light population levels provided the soils in these areas are adequate to take care of approved development levels (See Environmental Considerations, pp. 12, Questionnaire, pp. 7 and 10.)

North Carolina law will not allow a town to fail to serve with water or sewer an area within its jurisdiction if it elects to provide the same service to another area. The only way to preclude service would be to prevent the possibility of receiving demand. This can be realized by not allowing residential development. The Town proposes to limit residential development in conservation areas by imposing a low priority on improvements to facilities and through zoning.

- [5] The Town believes that a decision on whether to support a single regional wastetreatment system for the beaches or to support the building of several small package facilities within problem areas of the Town should be made within the next 48 months, or before the Town is faced with having to approve the platting of a large subdivision with a substantial portion of platted lots having poor soils and using septic systems: (Recent developments at federal level, especially in EPA hearings, may delay this decision).

- The Town is concerned with possible pollution of estuarine waters adjacent to it because the Town feels that septic tank effluent containing colonies of coliform is suspected of being able to move 10 to 20 feet per day and live for 30 days in significant numbers in soils with poor capacity to handle the effluent. Accordingly, the Town adopts a policy requiring future subdivisions to design areas nearest the Sound or other estuarine water with generous setbacks for septic systems and with large lots and lot width to accomplish the lowest practical density (Environmental Considerations, p. 12). The Town supports a policy of future subdivisions utilizing a minimum one acre lot size for lots within 500 feet of the Sound. Lots having soils designated by the Soil Conservation Service as not severe for septic systems should
- [6]

be exempted from this policy (See map of Soils Unsuitable for Septic Systems). The Town will investigate the use of a soils overlay ordinance and revision to the subdivision regulations to embrace this requirement within the next two years. The Town notes that the Coastal Resources Commission currently enforces a setback for septic systems from estuarine waters. This policy should enhance the goals of this legislation.

#### Transportation Systems

The transportation network is of special importance to the communities on the Outer Banks. The Outer Banks live with a 9% chance of a major hurricane striking the shores each year. In the event of a hurricane the island and the Town possess few places which can offer safe shelter; therefore, almost everyone must be evacuated from the barrier islands (Transportation, pp. 3-4). Any evacuation of the barrier islands from Corolla in Currituck County to Ocracoke in Hyde County must pass through Dare County, using either route U.S. 64 or U.S. 158. The capacity of both routes is severely limited by the bridge capacity (Transportation, pp. 5-6). The consultants estimated that capacity at approximately 115,000 under ideal conditions. Since the current population of the "to be evacuated area" is currently at that level, the system is at or near capacity. Through better planning the Town may be able to increase the capacity of the system. The major capacity limiting factor in the system is the bridge capacity on each route (Transportation, p. 9). The Town supports the building of another two or three lane bridge system from the barrier islands to the mainland. Nags Head has requested that the State Transportation Department give priority to the building of such a bridge in its 1980 Transportation Improvement Program.

The Town is concerned that the continuance of current growth trends will result in an overnight population of over 250,000 people on the Outer Banks (between Corolla and Ocracoke) by 1990. Since this capacity seems well beyond that which could be accommodated by better planning, [8] the Town believes that unless additional capacity to evacuate 60,000 additional people is provided by 1990 that all municipalities on the Outer Banks, together with the U.S. Park Service, should take measures to limit growth.

The Town contends that additional capacity could be reached on the present system by eliminating potential conflicts of use for the bridges, requiring earlier evacuation, restricting removal of accident-prone objects from the island and the like. Accident prone vehicles include all towed objects such as campers, trailers, boats and the like and vehicles of such mass as to be more likely to be blown over by strong winds. The Hurricane Evacuation Plan does not address these conflicts. The elimination of use of the bridges for boat thoroughfare and the reduction of the possibility of accident should increase the capacity [9] of the bridges. Nags Head recommends that Dare County revise its current Hurricane Evacuation Plan (published August 14, 1980) to address these issues.

During the past five years the Bypass has become increasingly relegated to a role as a local city street. Speeds on the Bypass seldom reach 35 mph during the summer as the road struggles to move vehicles well in excess of its designed capacity. The constant stops and starts are not only an inconvenience but a safety hazard (Transportation, p. 5-6). In 1972 the Department of Transportation developed a Thoroughfare Plan for Nags Head and Kill Devil Hills. [10] The Town supports the

Plan's proposal to multi-lane the Bypass (it specifically incorporates the plan into the Land Use Plan). In the event that the entire project could not be completed at one time, the Town supports actions that would multi-lane parts of the Bypass, even if the first sections to be paved were in Kill Devil Hills. In the event that multi-laning the Bypass [11] becomes unlikely, the Town supports other construction alternatives which preserve the objectives of the Thoroughfare Plan (see problems with priorities, Transportation, p. 8). The Town has already requested the Department of Transportation to undertake improvements to the Bypass. In the event this is unsuccessful, the Town will continue to urge the implementation of the Plan until it is implemented.

The Town notes that most of its commercial development is located [12] along the beach road. The Town favors the continued use of the beach road as a local collector.

The Town is aware that a through road along the soundside has been partially blocked by the building of the Villas condominiums. The Town will investigate methods to improve the road from Kill Devil Hills to the aforementioned condominiums. The Town believes that the road may become important if it is necessary to provide basic services to the [13] Nags Head Woods; especially fire, police and ambulance services. The Town favors a road in NH woods that will utilize, to a large extent, the old roadbed, and can be built with a below normal right-of-way and a minimum [14] amount of pavement. It is the Town policy to protect the mature vegetation along and near the ridge road in recognition of the importance it plays in the natural system of the Woods (see Nags Head Woods Study). The Town intends to modify its subdivision regulations to implement this policy. (This road is intended only as a local collector).



- [15] The Town favors Southside Road being connected with the Old Nags Head Cove subdivision.
- [16] The Town supports interim or permanent measures to alleviate traffic congestion on the Bypass, provided such action does not result in increasing the level of speed or amount of traffic on the beach road, or result in another bypass along the Sound.
- [17] In addition to the above, the Town supports the construction of a two lane bridge from the northern limits of Nags Head or the southern limits of Kill Devil Hills to Roanoke Island. The existence of such a bridge and access roadways would decrease traffic loads on the Bypass, and through the towns of Manteo and Nags Head.

Nags Head has considered numerous alternatives to the proposed multi-lane road. The Town rejects a bypass along the sound side through Kill Devil Hills because such a road on the sound side would likely encourage growth along the Sound which could be detrimental to this unique natural resource. The Town opposes a one-way pair system because it would pose increased danger to pedestrians crossing the beach road, the only street suitable for functioning with the Bypass as a pair. The Town accepts the opinion of the Department of Transportation that service roads are infeasible in light of the width of the rights-of-way (Transportation, pp. 10-11).

- As an interim measure for relieving congestion on the Bypass,
- [18] the Town shall take and continue to take numerous nonconstruction alternatives. The Town shall continue to seek to cut back on the
- [19] amount of commercially zoned area on the Bypass. The Town shall study the possibility of restricting permitted commercial development on the Bypass to only those types which do not generate substantial amounts

[20] of traffic. The Town shall, through zoning district amendments (to  
boundaries of districts), encourage commercial development to locate  
[21] in commercial parks rather than in strips along the Bypass. The Town  
shall study the feasibility of requiring deep setbacks for buildings  
from Bypass right-of-way; it will also consider standards for the  
design of parking lots so as to decrease the time required to exit  
[22] from the Bypass. The Town shall encourage commercial development to  
[23] exit into streets other than the Bypass where such options exist. The  
Town will discourage the number of entrances and exits onto the Bypass.  
(Such standards will be added to the subdivision regulations). Further-  
[24] more, the Town shall encourage businesses with complimentary uses  
(as where one has a day crowd and the other a night one) to share  
[25] common parking facilities. The Town shall limit the number of new  
streets entering the Bypass and it shall limit the number of mapped  
streets from being paved and connected to the Bypass by assigning a  
low priority to paving these and by paving them as if they were cul  
de sacs.

The policies are intended to alleviate some of the existing flow problems and to prevent the further aggravation of the situation. The Town calls on the State to foster legislation at the State level which will enable municipalities to restrict access to major highways where the right of access was not purchased but where the lot owner has adequate access to another street or road.

Nags Head has taken additional measures to immunize itself from energy shortages; measures that should also help alleviate traffic on the Bypass. The Town contends that if it and its neighbors can promise

the tourist that if he will drive to the beach communities he will not need his car during his stay, it will alleviate the potential for poor business years due to a lack of availability of fuel. Nags Head, with the cooperation of Kill Devil Hills, has sponsored a demonstration project providing mass transit along the beach road between the Kitty Hawk Fishing Pier and Coquina Beach. This project was inaugurated during the summer of 1980. If the project should ultimately prove feasible

[26] and acceptable by the public, the Town will foster a policy of providing public transportation to the beaches and commercial establishments for its residents and visitors.

Nags Head shall place a higher priority during the next ten years  
[27] on paving local roads. In setting priorities, the Town will consider whether the road is likely to encourage development on lots with poor soils for septic systems. Paving with 100% local government funds shall be provided according to the Town's priority list (see preceding pages for factors in setting priorities); persons desiring streets to be paved that are not on the list can obtain consideration for a higher priority by offering to share in the costs. Factors entering into setting priorities include relation to moving traffic throughout Town, alleviating congestion on the Bypass, number of people served, the likelihood of better access to the beach and the absence of promoting development in environmentally constrained areas, dunes, poor soil areas, wetlands, etc.

#### Environmental Constraints (Additional to those already discussed)

Because of the constant threat of a major hurricane or storm doing major damage to the Dare beaches and the Town of Nags Head, and because

most of the people who have built on the island have done so because they were aware that their houses would be insured against major loss [28] and catastrophe, the Town supports the continuation of federal flood insurance policies. The Town shows its consistency with the federal flood insurance program by enforcing standards consistent therewith, including a requirement that houses be built above flood elevation (see Flood Hazard Map).

The Town supports the policies of the Coastal Resources Commis- [29] sion. It is Town policy to be consistent with policies and standards [30] for areas of environmental concern. The Town desires to provide ad-  
ditional protection to the frontal dune system and to property owners  
relying on that system for protection. The Town shall implement this policy by encouraging all property owners of lots containing frontal  
or primary dunes to fill in breaches, rebuild low spots, revegetate  
barren areas, build walkways over the dunes and avoid other actions  
that could weaken the protective nature of the dune system. The Town in- tends to accomplish this by voluntary compliance and attention through media coverage via its regular newsletter except where such actions are subject to an existing permit. The Town will continue to enforce an appropriate building setback. The Town desires to review and devise building standards specifically engineered for the climate and type of structures built in Nags Head.

Nags Head is concerned that the Town not repeat the mistakes of beach communities along the northeast coast of this country. The Town believes that these mistakes resulted from allowing immoveable construction (buildings) along the ocean shore, which when the beach migrated (eroded) required the expenditure of public funds to protect the build-

ings (Beach Dynamics, pp. 1-2). Many of these communities have entirely lost their natural beach, so that the beach must be imported for the tourist season. In order to preserve the beach and the heart of the [31] economy, the Town fosters a policy of encouraging future motel and commercial development constructed of steel and concrete to locate west [32] of the beach road. Furthermore, it is Town policy that no person or legal entity be permitted to build a seawall, jetty, groin or other artificial device designed to stabilize the ocean shoreline. The Town intends to implement this policy by offering a bonus to developers in the form of lessened open space requirements in the zoning ordinance if they will locate west of the beach road. Also the Town expects DNRCDC to implement this policy in consistency review.

#### Open Space

Because of the strong demands for open space to meet the needs of the public to the public's natural resources (Questionnaire, pp. 10-11) and because of the desire to keep the oceanfront from becoming densely developed with motels which might require tremendous public expenditures [33] for shoreline stabilization, the Town shall increase the amount of open space along the oceanfront by increasing the amount of open space required in exchange for allowing higher densities on parts of the property and greater building heights (Housing, p. 24; Questionnaire, p. 11). The Town shall consider increasing the amount of open space required to three times the developed area (being the area occupied by the the building, sewage treatment system, recreational facilities and excluding area regulated by the CRC) for development in zoning districts

east of the beach road (see current Zoning Ordinance). Areas west of the beach road can be developed with a smaller open space requirement. (Note, see open space features in Zoning Ordinance, also, Questionnaire, pp. 4-5).

- [34] It is Town policy to provide adequate recreational opportunities, particularly beach access and parking for use of the ocean beaches and sounds for all residents of the Town. The Town intends to implement this policy through actions that call for the Town to maintain as beach access points the many dedicated street rights-of-way (extending from the beach road to the ocean.) The Town notes that in the past many of these rights-of-way have existed only on paper; and, because the Town had not taken steps to accept them, by clearing and maintaining them for public use, it has risked the areas being withdrawn by the developers or landowners (Recreation, p. 3). The Town requests that the State foster legislation that would remove this legal requirement for effective acceptance of a public right-of-way where the public use is not intended to be vehicular.

Many of the beach access points are capable of handling about 10 to 15 parked cars. Either parking areas near the beach or mass transit is needed if new development west of the Bypass is to have the same

- [35] access to the ocean enjoyed by others in the Town. In the event that the plans for providing public transportation for persons living west of the Bypass to the beach do not prove feasible or otherwise acceptable, the Town will provide beach parking areas for the use of persons who cannot reach the beach by walking or mass transit. The Town will make a decision on the amount of land that will need to be acquired and the method for acquisition following its evaluation of the success

of the mass transit system. At present the Town feels it is meeting the demand for beach access from its residents. The public transit plans together with the acceptance and maintenance of existing public access points identified in Beach Access Plan prepared by Williams and Works, 1978, should be adequate to meet future needs. Individual streets intended for paving are set out on the Town's priority list for paving local roads. In the event mass transit is not adequate, then the purchase of parking areas will be considered on an ad hoc basis. Neither the purchase of a site, nor its preparation for parking use requires long lead times (see Questionnaire, pp. 12 and 14 as to the importance of this issue to Town residents and property owners). An amendment to the Capital Facility Plan will be made to program the choice selected to implement the general policy of public access. The changes will be made within the next two years or as soon as the success of the mass transit system can be determined.

In addition to open space for recreation, the Town also believes [36] that open space should be provided for environmental protection. Through the use of Planned Unit Development ordinances (to be adopted 1981) the Town will encourage developers to concentrate development in the more developable areas and leave those more sensitive areas vacant. Also, the Town has acquired some 400 acres of sensitive environmental land in the Nags Head Woods; these lands are mostly unprotected wetlands and fresh water ponds. Through a special zone (called SPD) the Town has encouraged density transfer as a method of protecting privately owned sensitive lands in the Woods. (SPDs are Special Planning Districts) (Questionnaire, pp. 9, 11 and 14.)

In addition to recreational opportunities at the beach, the Town

[37] accepts as a public responsibility the provision of access for recreation to the Sound. The Town hopes that a mooring site for small boats could be provided through subdivision review. Several sites are possible; however, the waters adjacent to the shore are so shallow that any site may involve substantial dredging. The plan for Town property in the Woods provides for walking paths and picnic sites in this natural area. In addition to recreational opportunities for seasonal residents, the Town also intends to provide recreational facilities (especially a ballfield and picnic area) for the permanent residents on the Town's property. (Questionnaire, p. 14 [Woods] and p. 12 [recreation]. See, too, plan for Nags Head Woods.)

#### Housing

Nags Head realizes that, given its limited amount of space for development, the greatest net revenues can probably be attained by using a high density growth pattern with heavy motel and townhouse development. (Housing, p. 24) However, the Town feels that the importance that the seasonal and permanent residents give to the "family beach" atmosphere with its single family cottages overshadows the importance of taxes. (Questionnaire, p. 8) For the most part, the property owners and residents of Nags Head showed a strong willingness to pay for the facilities the Town will need to accommodate its growth.

[38] (Questionnaire, p. 15) Therefore, it is Town policy to encourage a housing mix that is heavily single family. In environmentally sensitive areas the Town encourages higher density development of less sensitive lands in order that the more sensitive lands be left in open space. (Questionnaire, p. 10) (Special zones [SPD's] are currently used; a new PUD ordinance will be developed.)



Nags Head will continue unstated policies of the past concerning uses in the area known as South Nags Head; namely, exclusively residential, and in the Woods; namely, low intensity residential.

As was stated before, the ocean front will be encouraged to develop in single family or at least moveable structures. This has become more important in the light of recent erosion problems which caused the virtual destruction of several houses in South Nags Head and also caused several other threatened houses to be moved. The zone immediately adjacent to the beach road and west of it seems most desirable for future motel development. It should be noted that motel development has nearly halted since 1973; the loss of this market has been attributed to the high costs of borrowed money, the costs of building a package sewage treatment plant, and Environmental Management Commission policies on package plants. Another factor in the lack of motel development may be an overbuilding of motels with an accompanying high vacancy rate in the units which has only recently disappeared. For whatever reason, the motel development which constituted such a large portion of total lodging units in the Town in 1973 has by 1980 significantly declined.

One of the most colorful areas in Nags Head is the old historic area where beach cottages between 30 and 60 years old huddle behind large dunes on the oceanfront for a span of over a mile. Many of these cottages are on the National Register. The Town encourages the preservation of this historic area. Many of the cottages are still in original ownership. The Town will consider the adoption of a zoning ordinance amendment, pursuant to authority granted by N.C.G.S. 160A-395 through 160A-399, to designate the area as an historic district. Such action would protect this highly aesthetic area from pressures of redevelopment

and from the possibility of incompatible architectural designs on neighboring tracts. Much of the information necessary to warrant historic district designation has been completed by the Town.

#### Surface Drainage

The Town has made a concerted effort to identify solutions to its surface water drainage problems. A separate report was completed this year by Coastal Consultants, Ltd., and McDowell-Jones, P.A. Recommendations are presented in that report and are incorporated in this report by reference. The Town is concerned with waterflow in and around the [40] Bypass, especially during and after major storms. The Town calls on the State Department of Transportation to engineer, design and build storm surge culverts to allow movement of water under the Bypass.

[41] The Town is opposed to the building of new finger canal systems. Such systems pose unacceptable risks to the pollution of the Sound and may increase the risk of inlets being formed on the island.

#### AEC's and Land Use Plan

[42] The Town feels that appropriate uses within the Town's AEC's shall be those set out in the AEC's by the Coastal Resources Commission, except where more stringent restrictions have been placed on development by the Town through its zoning regulations or subdivision controls. The Town supports the efforts of local residents and property owners who have attempted to stabilize the dune system by doing sand pushing and vegetation. (AEC's, pp. 1-4)

#### Nags Head Woods

Nags Head has undertaken a special study of the Woods to determine a proper management scheme for it. The Town reaffirms its desires to

protect this area containing rare and endangered species, a special ecosystem consisting of marshland, hammocks, bay forest, ridge forest, fresh water ponds and dunes. Currently the Town is utilizing an SPD zone (sort of PUD zone) with 40,000 square foot minimum lot sizes. The Woods report would create a special zone for the Woods with densities based on the capacity of natural features within the zone. The Town feels this system may provide fairer and more equitable relief to residents of the Woods and preserve important public resources.

The policies for the Woods are as follows:

- [43] It is the policy of the Town of Nags Head to protect from development as much as is possible the unique and natural features in the Nags Head Woods. It is also Town policy to respect the rights of those persons who own land in the Woods to have a reasonable and practical use of their property, including a reasonable rate of return.

- The Town feels that some features in the Woods deserve more protection than others. This may be due to its unique environmental importance, its geologic importance, its historic importance, its recreational importance
- [44] or a combination of these. The Town is particularly interested in protecting those feature which if not protected would result in the loss of the Woods as a unique natural area. In order of importance the Town wishes to protect: the hammocks, the ridge forest, the edges of the fresh water ponds, the ponds, the marsh, the dunes, the bay forest and scenic areas.

- The Town hopes to accomplish this protection through Town regulations.
- [45] It proposes to adopt district zones that conform to the natural boundaries of the elements of the total system that makes up the Woods and to prescribe an appropriate development density for each zone. The Town proposes to use PUD style development to transfer density from an entire

tract to that part of the tract which has been identified as most able to be developed without damaging the environment (see map). The Town also proposes to place setbacks on ponds; restrictions on filling ponds; restrictions on building on steep slopes, in hazard areas, etc. The Town proposes to revise vegetation standards from the SPD zone and to set requirements on cover and protection of rare and endangered species.

#### Off-Road Vehicles

The Town shall continue its restriction on the use of off-road vehicles during certain times of the year. Furthermore, it shall continue to control beach uses, to prevent conflicts between uses.

#### Energy Facilities

- [46] The Town is opposed to energy facilities, including pipelines, docking facilities and plants, locating anywhere within the Town's jurisdiction. Such uses are deemed incompatible with the intensive uses of the beaches for recreation. These uses are not permitted in the zoning ordinance.

#### Natural Resource Uses

- Agricultural lands, commercial forest lands, mineral production areas, and commercial fisheries are not a significant use within the
- [47] Town. Nags Head is opposed to commercial or non-commercial cutting of the Nags Head Woods timber and to mining activities there. The Town feels that the sole agricultural use of the Woods will be discontinued in the near future; it is not opposed to the use or its continuance.

The Town feels its policies on development on poor soils for septic systems are adequate to protect fisheries near Nags Head. The Town

- [48] feels that commercial fishery uses within the Town are incompatible with

other uses in the Town. Such additional uses have been eliminated in the zoning ordinance.

#### Public Participation

The Town has attempted to encourage the public to participate in the planning process. The public, including all residents, property owners and other persons on the Nags Head mailing list, was mailed a copy of the initial questionnaire. Over 300 of these were returned to the Town for its consideration. The issue-oriented approach used in the questionnaire allowed the Town to benefit from the attitudes expressed. In addition to the questionnaire, the Town used a Public Forum (technique spelled out in consultants' reports) to allow the citizens to determine the focus of the land use plan, especially the issues that would be investigated. The Town Board met to discuss reports and issues in the Plan at its regular meetings and at several special work sessions. The Town had considerable news coverage during the process.

[49]     The Town will continue to provide a strong citizen participation program for the future. The Town will accomplish this by heavy reliance on distributing information to its residents, property owners and others who request the information, via its regular newsletter. The Town publicizes notice of its meetings in the local newspapers and over community watch on local radio and television. The public is cordially invited to attend Town meetings and Planning Board meetings.

[50]     The Town has a policy of cooperating with other municipalities on the Dare Outer Banks, with the County, State and Federal government in pursuing all the aforementioned policies.

### Additional Implementation

In addition to the specific implementation devices set out for individual policies, the Town also will use priorities for projects and funding as a means to implement the policies. In funding or seeking funding for projects, the Town will follow the below-mentioned priorities: (top priority set out first)

- (1) projects remedying past problems or which are designed to take care of the needs of the present population;
- (2) projects designed to alleviate problems from anticipated or future populations' needs;
- (3) projects which offer convenience but are not necessary to the health or safety of the people.

Although it is not possible always to select the timing and funding of improvements without considering the funds available or the costs of the project, the Town favors the following priorities for large capital projects:

- (1) water improvements;
- (2) transportation improvements;
- (3) public sewer system.

In weighing the costs and benefits from individual projects, the Town seeks to give the heaviest weights to recreational benefits, then to safety benefits, then to convenience benefits. In resolving conflicts in the use of the police power or the management system, the Town shall favor: (most important set out first)

- (1) environmental and health conditions;
- (2) transportation and safety conditions;
- (3) open space, amenity and welfare conditions;
- (4) other conditions.

### A Note on Implementation

In several instances the Town proposed to make changes in the zoning ordinance, subdivision regulations, capital facility plan, and the beach access plan to effectuate more harmony with policies stated herein. The Town proposes to address these changes under the following schedule:

- (1) PUD ordinance to implement open space policy and Woods protection, etc., 1980-1981;
- (2) revise zoning ordinance for handling density, uses on ocean-front, commercial uses, beach access, etc., 1981-1982;
- (3) revise subdivision regulations to do same as above, 1981-1982
- (4) revise capital facility plan to reflect decision on water and sewer improvements, building of local roads and beach access, rights-of-way, use of mass transit and possible purely use of open space, 1983-1984;
- (5) revise beach access plan, 1983-1984;
- (6) revise land use plan, 1984-1985

## SECTION TWO: TECHNICAL PAPERS

- Chapter I. Population Analysis
- Chapter II. Values and Attitudes of Nags Head:  
An Analysis of the Nags Head Questionnaire
- Chapter III. Environmental Considerations Relating to  
Water and Sewer
- Chapter IV. Other Environmental Considerations
  - A. Beach Dynamics
  - B. Areas of Environmental Concern
  - C. Environmental and Other Constraints
  - D. Nags Head Woods
  - E. Environmental Policy
- Chapter V. Transportation System. Hurricane  
Evacuation and Thoroughfare Movement
- Chapter VI. Analysis of Implication of Different Housing  
Mixes
- Chapter VII. Recreational Aspects
- Chapter VIII. Cultural Resources
- Chapter IX. Carrying Capacity: Methodology and Application



## CHAPTER I

### POPULATION ANALYSIS

The proper place to begin the planning process in a beach community in North Carolina is with the study of its population. It is the changes in population that place demands on facilities that pose conflicts with the environment, with health and safety, with recreation.

This particular study will seek to focus on viewing population in terms of its natural increase and the carrying capacity of the land, the housing stock and facilities which could limit or restrict the achievement of this growth. Growth may be limited by the inability to evacuate the town in the event of a hurricane, or the inability to move traffic effectively from one part of the town to another, or the inability to provide additional water for drinking or bathing, or the inability of the environment to accommodate effluent from septic systems, etc.

#### Measuring Population

In most communities in the United States the permanent population does not differ substantially from the population or inhabitants of the community at any time during the year. Because it is necessary to understand population in order to assess growth and impacts on housing, transportation, environment, much attention has been paid

to methods to determine the permanent population. In the North Carolina beach community there is a considerable difference between the peak summer population and the permanent population (both in numbers and composition.) To fully appreciate the effects of growth we must concern ourselves with the peak population and with the difference between peak and permanent population. Peak population may frustrate our capacity and cause irreversible damage to health, safety, the environment or certain facilities. The strong differences in population may make the delivery of services and facilities difficult and costly.

The best method to measure the population of a community is through a direct head count. Regretably we are not aware that any direct count of population during the peak season exists in Nags Head. Certainly this is an undertaking which the Town should consider pursuing in the future. To measure population in the absence of this data, we resorted to measuring the evidence of population--the number of houses occupied, the size of the units and the use of water.

#### Housing Information

During the months of November and December 1979 we surveyed the entire town of Nags Head. We mapped the location of every building in town. We attempted to identify its use--residential, commercial housing (motel and cottage court), and uninhabited structures (restaurants, government buildings, etc.) We also attempted to establish the number of bedrooms in each residence and the number of rooms in commercial housing.

In order to portray this information in a more meaningful manner, we artificially divided the Town into sections. These sections are as follows:

#1 Beach Road (both sides) from Kill Devil Hills town limits to Empire Street

#2 From ocean to sound, between Forest Street and Empire Street

#3 From ocean to sound, between Forest Street and Whalebone Junction

#4 South Nags Head

#5 From Whalebone Junction to Washington Baum Bridge

#6 Between Beach Road and Bypass from Kill Devil Hills town limits to Empire Street

#7 Subdivisions west of the Bypass, not included in #2 and #3 above.

TABLE 1

## RESIDENTIAL AND COMMERCIAL HOUSING UNITS

Section	Residential (By Bedroom)							Commercial			Total
	MH	2	3	4	6	8	9+	T	CC	M	
#1	20	43	93	91	46	25	6	7	196	364	891
#2	0	0	0	4	0	0	0	0	0	0	4
#3	18	11	60	10	0	0	0	10	387	441	937
#4	0	38	229	160	2	0	0	0	257	196	882
#5	0	5	13	7	0	0	0	0	10	0	35
#6	0	16	160	33	0	0	0	0	0	0	209
#7	0	35	203	65	0	0	0	10	0	0	303
Total	38	148	758	370	48	25	6	17	850	1001	3261

Note: MH=mobile home T=townhouse CC=cottage court M=motel

### Relating Water Use to Population

In order to establish a meaningful relationship between water use and population, we focused sharply on motels. Motels offered us the opportunity to observe hundreds of people under similar conditions. Furthermore, because they were under one management or administration, they afforded us the opportunity to probe for unusual uses.

The motel managers and owners informed us that they reached peak population in the last week in June and sustained that population constantly to the first week in September. They maintained that the average occupancy was in excess of 3 persons per unit; that more than 50% of them were inhabited by children. By reading the records on water usage for the July and August period, we concluded that water use ranged from 4,600 to 23,100 gallons per unit, with an average of 13,840 gallons. In the 62 day period covered by the water records, we expect that the typical unit experienced full occupancy on 60 days.

TABLE 2  
MOTEL WATER USE AND OCCUPANCY

[Range] Gallons/Unit Peak Season	Day	Varying Rates of Occupancy			
		2.5	3.0	3.5	4.0
1,900	181.60	73	61	52	45
13,800	230.0	92	77	66	58
18,200	303.3	121	101	87	76

In addition to examining water use in motels, we also examined water use in three distinct residential communities, Goosewing sub-division in South Nags Head, Nags Head Cove on the west side of the

Bypass and the cottages along the ocean north of the Watertower. The Goosewing and Cove subdivision contrast water usages between oceanfront and soundside subdivisions made up predominantly of three and four bedroom houses, whereas the Old Cottages along the ocean give us an opportunity to examine the effect of large houses. Ideally we would like to have done this through a better sampling procedure.

TABLE 3  
RESIDENTIAL WATER USE

Subdivision	Units							Ave. A
		0-10	11-20	21-30	31-40	41-50	50+	
Goosewing	16	6	25	31	38	0	0	24.4
Nags Head Cove	136	28	44	18	4	4	1	15.4
Ocean Cottages	22	0	14	32	14	14	27	38.2

TABLE 4  
BEDROOM SIZE PER RESIDENCES (%)

Subdivision	Units						Ave.
		2	3	4	6	8+	
Goosewing	18	0	33	67	0	0	3.6
Nags Head Cove	141	7	58	31	4	0	3.2
Ocean Cottages	21	0	14	5	24	57	7.4

TABLE 5  
WATER USE PER UNIT (1000 gallons)

Subdivision	Average Per Unit	Average Per Bedroom	Daily Ave.
Goosewing	24.4	6.8	.115
Nags Head Cove	15.4	4.8	.081
Ocean Cottages	38.2	5.2*	.088

\*It is possible that we have overstated the number of bedrooms per unit in the old cottages.

#### Town Water Uses (Flows)

If we examine the town's total delivery or sales of water for each day during the same season, we can get a view of the flow of population, of peak as opposed to average demand. We decided to read water usages for the period of July 27th to August 23rd in 1979 and 1977. This period was chosen because it does not reflect a major holiday and should exhibit patterns of occupancy.

TABLE 6  
FLOW DATA (1000 gallons)

Year	0-650	651-700	701-750	751-800	801-850	851-900	901-950	950+
1977	5	5	6	6	3	0	1	2
1979	0	0	0	0	0	3	12	13
<hr/>								
Year	Max.			Min.		Ave.		
1977	1332			417		751		
1979	1011			894		949		

We should note that the January maximum and minimum for both years is about the same, namely from 110 to 375 (thousands of gallons per day.) Water usage in 1979 was constantly within 5% of the average, showing little deviation. This absence of fluctuation is significant because it establishes a presumption that the residential home and cottage population is fairly constant throughout the summer months of July and August. If we assumed that 90% of the units were occupied during the peak days in the summer, then that percentage was maintained within 10% throughout the rest of summer.

We can calculate the residential occupancy through a second procedure. We can determine the water used by the commercial housing sector by multiplying the number of units (1951) by the gallons per day used by each unit (230). We can estimate the amount of sales to restaurants and other non-housing users. By adding these together and subtracting them from the average daily use by all sectors we can establish an average rate for the residential sector. These computations are as follows:

Average Daily Sales During Peak Month	949,000 gallons
Less: Commercial Housing	425,730
Other Non-Residential	94,900
Average Daily Residential Sales	428,370 gallons

Since the number of residential units (not including motels and cottage courts) was 1410, the average water use by such units during a day in the peak season was 303.8 gallons. We noted from the previous page that water uses in three distinct sectors of Nags Head was: (presuming 90% occupancy)

TABLE 7  
WATER USE IN RESIDENTIAL SECTOR

Sector	Gallons/Day/Unit	Gallons/Day/Bedroom
Goosewing	435	121
Nags Head Cove	275	85
Ocea Cottages	682	93

Since 3 bedroom and smaller units comprise 67% of the residential housing stock in Nags Head, a water usage rate that is somewhat higher than the Nags Head Cove subdivision seems reasonable. From our analysis of the motels, we concluded that a water usage of about 65 gallons per person per day there seemed reasonable. One would expect that this number should be adjusted upwards for the residential sector to account for additional uses, such as food preparation, washing of dishes, cars, and clothes and lawn-watering. Yet from our own experience we doubt that water use equals that of the permanent home dweller. Our data suggests that water use varies with proximity to the beach and with number of bedrooms in the dwelling. For purposes of estimating population, we have used the following rates.

TABLE 8  
WATER USAGE

Sector	Gallons/Day/Bedroom	Persons/Bedroom
Beach	110 (75 gallons/person)	1.5
Bypass and Sound	85 (65 gallons/person)	1.3



In the following table we have attempted to estimate population for each sector.

TABLE 9  
POPULATION BY HOUSING TYPE

Section	Residential								Commercial		Total
	MH	2	3	4	6	8	9+	T	CC	M	
#1	60	129	419	546	414	300	90	26	686	1274	3944
#2	0	0	0	24	0	0	0	0	0	0	24
#3	47	29	234	52	0	0	0	33	1355	1544	3294
#4	0	114	1031	960	18	0	0	0	900	686	3709
#5	0	13	34	27	0	0	0	0	35	0	109
#6	0	42	624	172	0	0	0	0	0	0	838
#7	0	91	792	338	0	0	0	468	0	0	1689
Total	107	418	3134	2119	432	300	90	527	2976	3504	13607

Because many land use standards and information about health and the environment are often given in terms of density, we have expressed this population in this manner in the chart below.

TABLE 10  
POPULATION DENSITY PER SECTOR

Sector	Population	Square Miles	Persons/Square Mile
#1	3944	.650	6068
#2	24	.750	32
#3	3294	.500	6588
#4	3709	.850	4364
#5	109	.350	311
#6	838	.400	2095
#7	1689	1.500	1126
Total	13607	5.000*	2721

\*This number does not include the area in Jockey's Ridge.

### Population Projection

Population projections for 1990 can be determined in several ways. One method is extend the increase of water usage into the future. This method assumes that the capacity per unit does not change (this excess is at least 0.7 per bedroom.) Also, this method must rely on consistency in the amount of water used by an average resident. A second method is to project the rate of growth through extending the rate of new building starts. In any event these factors should be tempered by market factors including the availability of gasoline for transportation, high interest rates and inflation which affect building and spending, increased importance of leisure time and recreation, propensities in the national market towards townhouse development, etc.

An analysis of the water delivered by Nags Head Water system to its customers shows the following growth details.

TABLE 11  
NAGS HEAD WATER SALES 1968-1979

	1979	1977
July-August 29 day period (average)	949	751

From examining the water records it is apparent that the rate of growth as measured by increases in water sales exceeds 8% per year for the past five years. In addition the water sales indicate that this growth rate has increased dramatically during the past two years

to 12.5%. At a rate of 8% the population will double in 9 years; at a rate of 12 to 13%, the population will double in about 6 years.

An analysis of the housing permits since 1975 shows the following:

TABLE 12  
PERMITS FOR NEW HOUSING STARTS 1975-79

Year	Single family	Multifamily	Motel
1975	38	0	0
1976	80	12	0
1977	124	14	0
1978	127	1	0
1979	110	0	0

We noted that in 1979 there were 1355 single family dwellings. From 1975 to 1979, 479 units were built. Thus, the number of single family units in 1974 appears to be approximately 876 units. Between 1975-1979 the housing stock of single family dwellings increased 54.6%, with an average annual rate of 9%.

From analyzing the housing starts, we also noticed that the number of multi-family units added to the housing stock was considerable due to the building of the Villas during the last five years, however, these building permits were added prior to the year 1975. New multifamily units may add a significant amount to the population during the coming years, however, it will be difficult to forecast the number of units since these decisions appear to be without enough regularity to establish a pattern. The amount of motel and cottage court development during the past 5 years does not appear to be significant.

By combining our information on trends over the past five years, we can predict that if past trends continue that by 1990 the population will reach the following limits:

TABLE 13  
POPULATION 1980-1990

	1980	1990	Increase
Average daily August	13607	32212	18605
Maximum day	14560	48318	33758

#### Projected Population and Housing

A rough idea of the impact of this population on the land can be obtained if we continue the trends of the 1970s with regard to housing mix and location. From our housing inventory we noted that since 1975 new opportunities have been limited to mostly three and four bedroom single family houses. Also, the areas exhibiting the greatest growth rates appear to be in South Nags Head and the subdivisions west of the bypass and north of the water tower. Future growth will probably continue this trend. In addition the availability of the Epstein tract for development should result in growth in that section. It also seems inevitable that the next ten years will place considerable pressure on redeveloping some of the beach road.

If we assume that future residents will continue the trends of the recent past (especially the past 5 to 10 years); then, we expect that the future housing mix can be predicted and contrasted against the past and the complete 1990 housing stock as follows:

TABLE 14  
PERCENTAGE OF PERSONS LIVING IN  
EACH HOUSING TYPE

Year	MH	2	3	4	6	8	T	CC	M
1980-90	0	3	45	27	5	0	10	5	5
1980	1	3	23	16	3	6	4	22	26
1990	0	3	38	23	4	2	8	12	14

In terms of new housing units, the housing breakdown to meet residential demand may result in the following new units being built by 1990.

TABLE 15  
NEW HOUSING UNITS

Unit Type	# New People	# New Units
Residential: 2 bedroom	558	215
Residential: 3 bedroom	8372	2147
Residential: 4 bedroom	5023	966
Residential: 6 bedroom	930	119
Townhouse	1860	580
Cottage court	930	290
Motels	930	290

#### Comment

The principal purpose of this section is to show the number of people likely to reside in the town throughout its tourist season and where and in what type units this population can be expected to live based on past trends. In conclusion, the town can expect 18,600 addition residents to 1990. Most of these people will live in a

variety of single family housing types. Sections 1, 3 and 4 are already beyond the density suggested by the state for public sewer, sections 2, 4 and 6 are most likely to incur new growth. See section on carrying capacity, to appreciate implications in terms of capacity. See section on housing for analysis on facility demand and for implications of housing mixes on revenues and open space.

## CHAPTER II

### VALUES AND ATTITUDES OF PERSONS OF NAGS HEAD: AN ANALYSIS OF THE NAGS HEAD QUESTIONNAIRE

The public participation element to the land use plan focused around the attitudinal survey of citizens directly involved in the future of Nags Head. In order to understand citizen attitudes, we prepared a questionnaire which explored the interfaces of the issues arising from the public forum. The questionnaire is issue oriented. It has a controlled narrative which provides a minimum amount of educational information on the subject. This assures that all participants have some basic information on the issues; it serves to eliminate conflicts due solely to different assumptions about facts surrounding the issues. The questionnaire attempts to balance conflicting (or seemingly conflicting) attitudes. It attempts to gauge the willingness to pay and the sense of priorities towards future actions.

The Nags Head Questionnaire was distributed to all persons whose names appear on the official town mailing list. This list consists primarily of permanent residents and non-resident property owners.

#### Conclusions

The Nags Head Questionnaire does not lend itself to a simple analysis, however, it is possible to draw several conclusions which may help to serve as an overview to the closer analysis.

(1) The respondents (persons who responded to the questionnaire and representing the larger group of permanent residents and non-resident property owners) place the following priorities on the spending of the Town's monies for facilities and services: first, they wish the Town to improve the water system; second, they desire the Town to purchase access and/or build parking areas for ocean or sound access.

(2) The respondents feel that it is important that the Town preserve some large tracts of open space. In order to obtain open space, they would be willing to accept higher densities. However, they desire to keep a housing mix that preserves the sense of the family beach, which they fear is most threatened by high-rise motels.

(3) The respondents would like to see the Town's property in Nags Head Woods used for low intensity recreation or left in its natural state.

(4) The respondents would like to see some action taken to cure the transportation problems--but this does not include a two-lane road along the sound.

(5) Other than beach access and parking, the respondents do not feel there is a need for additional recreational facilities.

(6) The respondents do not show much sensitivity to fiscal aspects, such as costs, tax base and taxes, and revenue generation, in their decisionmaking.

(7) The respondents feel there is a need to limit growth.



### Background of the Respondents

The Nags Head Questionnaire was tallied and analyzed when approximately 310 responses had been received. Since that time the Town has received an additional 100 responses. Although these latter responses were not included in this tally, we feel that the results would not be significantly different if the entire results were considered.

Considering the background information, we noted the following breakdowns in people's perception of how they related to the Town.

(# means number of responses)

TABLE 1

Residency	#	%
Permanent residents	81	28.4
Non-resident property owners	178	62.4
Seasonal visitors	16	5.6
Other	10	3.5

(Note: most of the seasonal visitors and others appeared to be non-resident property owners.)

TABLE 2

Interest (Occupation/Hobby/etc.)	#	%
Developers, builders	20	6.1
Commercial businessmen	46	14.8
Motel owners/managers etc.	23	7.4
Sportsfishermen/boaters	111	35.8
Beach users	224	72.0
Retirees	87	28.0
Housewives	42	13.5
Laborer	10	3.2

For purposes of analysis, we have regrouped the interest groups above into four larger groups, commercial, sport, retirees and others.

TABLE 3

Political Process	#	%
Active voter in Town elections	66	21.7
Ineligible to vote in Town	212	69.7
Eligible, but not active	26	8.5

TABLE 4

Geographic Area	#	%
Kill Devil Hills to Jockeys Ridge	109	38.7
Jockeys Ridge to Watertower	65	23.0
Watertower to Whalebone Junction	24	8.5
Whalebone Junction to Park Service	79	28.0
Whalebone Junction to Washington Baum Bridge	5	1.8

TABLE 5

Age Classification	#	%
19-35	26	8.6
36-50	91	30.0
Over 50	186	61.4

We were able to use the background identifications to perform several useful cross tabulations (comparing the group that answered a particular question one way with their responses to another question.

### Substantive Aspects of the Questionnaire

#### Growth, Water and Sewer:

The first question addressed to the respondents sought to understand their attitude towards the future growth of the Town. The respondents expressed a strong desire to restrict growth to an amount below that which was likely to cause expenditures to build capital facilities.

TABLE 6

Attitude to Growth	#	%	Cum. %
Town should accept its natural growth	120	40.1	40.1
Town should restrict growth			59.9
No growth	31	10.3	
Amount below facilities capacity	80	26.7	
Grow up to facilities capacity	68	22.7	

The permanent residents exhibited a stronger restrict growth attitude when compared with non-resident property owners.

TABLE 7

Reference Group	Attitude to Growth (# and %)							
	Accept		Major I.		Below		No Growth	
Commercial interest	41	63%	14	22%	9	14%	1	2%
Non-commercial	79	34	54	23	71	30	30	13

This difference can be anticipated in that non-resident property owners will show a greater preference to not restricting growth in that the majority of them own property which may not be capable of

being developed should the town be able to implement a slow or no growth policy. Similarly, residents tend to illustrate an old maxim-- "now that we are in, let's bar the gate."

The attitude towards growth is also sensitive to interests essentially vocational or avocational. If we compare those persons with a commercial interest (developers, builders, motel owners and managers, and commercial businessmen) with the rest of the sample, we find the following:

TABLE 8

Reference Group	Attitude to Growth (# and %)							
	Accept		Major I.		Below		No Growth	
Commercial interest	41	63%	14	22%	9	14%	1	2%
Non-commercial	79	34	54	23	71	30	30	13

The commercial sector had the most interest in accepting and probably encouraging growth. Since the commercial interest group is over-represented in the sample, the removal of this group from responses on the growth rate will accentuate the "restrict growth" attitudes.

In order to sharpen the rationale behind the restrict growth attitude, we asked the respondents whether they wished to improve the water system. The alternative would be to use this improvements denial as a means of restricting growth.

TABLE 9

Attitude Towards Water System	#	%
Do not improve public water system	78	26.0
Improve water system to handle 33,000 people	130	43.3
Improve water system to handle 50,000 people	92	30.6

The results show that the water system is not the major capital facility that the respondents wish to avoid paying for. We next asked the respondents if they desired to fund a public sewer system.

TABLE 10

Attitude Towards Sewer System	#	%
Build or participate in public sewer system	150	50.5%
Do not build or participate	147	49.5

In order to determine if people were deciding their growth attitude on the basis of their sewer response, we crosstabbed the growth question with the sewer question. The results were affirmative. In fact, the converse also proved to be true, that is, 81% of those who desired to accept the natural growth rate desired to see public sewers built.

#### Housing Mix and Open Space:

Because planners believe that housing mix has a profound influence on the tax base, the amount of open space and the image of the town, we

decided that we needed to explore the people's attitudes towards this subject matter. (Housing mix means the type of housing--single family, townhouse, cottage court, motel.) Our respondents ranked the loss of the family beach and the preserving of open space and the environment as the most important factors in selecting a preferred housing mix. Interestingly enough, fiscal aspects definitely took a "back seat."

TABLE 11

Factor of Importance to Housing Mix Decision	Ranking in Terms of Importance		
	1st	2nd	3rd
Loss of family beach atmosphere	55%	28%	5%
Increase money spent by tourists	6	6	59
Increase efficiency of services	4	17	7
Preserve open space and environment	32	44	8
Strengthen the tax base	3	6	21

In contrasting interest groups, we note that permanent residents were more inclined to rank open space and the environment as more important, similarly they did not feel as strongly about preserving the family beach atmosphere.

Concerning the factor most likely to destroy the family beach atmosphere, the respondents named high-rise motels as most important. (In retrospect we wish we had given more choices.)

TABLE 12

Factor Most Injurious to Preserving Family Beach	#	%
Retirement community	14	6.1
High rise motels	137	60.0
City-type night entertainment	77	33.8

If we had stopped our line of questioning here, we would only have affirmed the results of the 1975 citizen attitude survey done by the town. We decided that the best way to measure the strength of the housing mix response was to test it with some specific application. We asked the respondents if they were willing to be flexible on their attitude towards housing mix (i.e. promote family beach) if the result were to be a significant increase in large tracts of open space. A majority of the respondents were willing to make this trade.

TABLE 13

Willing to Trade Higher Density for Increased Open Space	#	%
Willing to trade	154	52.9%
Not willing to trade	137	47.1

This was a surprising response. But, we noted that the desire to preserve open space by purchase or through density transfer was perhaps stronger than could be anticipated when we asked the question of factors of importance in selecting a preferred housing mix. Then too, the willingness to make a trade does not reflect preferences,

i.e. just because a factor is your second preference doesn't mean that you wouldn't be willing to trade a portion of your first preference to get all you desire of your second preference.

All this implies that the respondents desired to see large tracts of open space in Nags Head. The respondents undoubtedly did:

TABLE 14

Attitude Towards Preserving Large Tracts of Open Space	#	%	Cum. %
Desire to preserve large tracts	264		91.8
Only without Town purchasing them	(105)	36.4	
Even if Town must purchase	(159)	55.2	
No open space	24	8.3	8.3

The permanent residents felt stronger about having open space and the environment preserved through means other than purchase by the Town.

In terms of the location of the open space, the respondents desired to place as their first priority the dunes. They were relatively indifferent as to second and third choices. The answer appears to reflect a desire to see the geological aspects and the recreational aspects of the beach preserved. It perhaps reflects some confusion over the importance of environmental features--other surveys seem to lead to the conclusion that the people may believe the dunes to be more important as an environmentally sensitive area than the marshes or live-oak forests.

Because we appeared to spot some confusion and inconsistency, we decided to cross-tab various interest groups with the desire to trade high density for open space. The results indicate that the



strongest support for preserving open space through density transfer came from the commercial sector and those who valued preserving open space in their selection of housing mix.

TABLE 15

Reference Group	Willingness to Trade Higher Density for Increased Open Space	
	Willing	Not Willing
Permanent Residents	50%	50%
Non-residents et al	54	46
Commercial Interests	64%	36%
Non-commercial interests	50	50
Open space as most important factor in housing mix	57%	43%
Other factors more important	51	49

(Note: Although this last crosstab suggests strong support for the trade from the group that valued open space as the most important factor in selecting a housing mix, this number should have in fact been much higher since this group would theoretically have nothing to trade.)

#### Zoning:

The respondents felt satisfied about the amount of land zoned for commercial use. However, 22% did indicate that the amount of land so zoned was too much.

#### Recreational Facilities:

We asked the respondents to select and rank recreation facilities which were needed in Nags Head and which they would like to see provided at public expense. We noted the following response. A combined score of over 145 (1st, 2nd and 3rd choice) probably indicates majority support.

TABLE 16

Facility Considered for Funding	Ranking in Terms of Importance				
	1st	2nd	3rd	Total	Wt. Score
Beach access areas	162	38	12	212	574
Parking for beach access	28	104	27	159	319
Sound access areas	6	26	87	119	157
Boat ramps and moorings	10	13	22	45	78
Indoor ballcourts	2	2	4	8	14
Tennis courts	9	8	6	23	46
Ballfields	2	4	4	10	18
Golf course	7	3	7	17	34
Playgrounds	5	6	3	14	30
Picnic facilities	1	13	21	35	50
Jogging and walking paths	40	15	26	81	176

We achieved a weighted score by giving 3 points to the first choice, 2 to the second and 1 to the third. These weights are arbitrary and merely designed to help in showing a spread in the number under a situation where the preferences are not equal.

#### Transportation System:

In order to analyze the transportation system alternatives, we resorted to asking the respondents to rank five possibilities in terms of their preferences. Then we asked them to explain the rationale behind their choices. In order to express this rather confusing response, we again resorted to placing arbitrary weights upon the responses. We gave 5 points to the first choice, 4 to the second, 3 to the third and a -5 to the fifth or least preferred alternative. We felt that this was justified in that where people do not seem to have a clear first or second choice, it may be more important to understand what they do not want. The scores are as follows:

TABLE 17

Transportation System Being Considered	Ranking in Terms of Importance				Wt. Score
	1st	2nd	3rd	Last	
Keep present situation	73	21	35	36	382
Make bypass four-lane	131	37	27	15	809
Build feeder roads	27	79	38	12	505
Build a new soundside road	13	30	43	35	139
Restrict access; eliminate turns, etc.	50	64	38	11	565

The results indicate a strong support for four-laning the bypass. Second and third choices emphasize non-construction alternatives and building feeder roads. Once again the respondents indicated that they were rather insensitive to costs or taxes. 62% of the respondents indicated that the most important factor in their transportation decision was the degree to which they believed the problem would be cured.

In terms of alternative transportation, 55% of the respondents would be willing to pay an additional \$25 in taxes and fees per year to have the Town build bikeways and pedestrian paths.

#### Nags Head Woods:

One of the major open space areas of significant environmental consequence appears to be the Nags Head Woods. We should note that earlier in the survey the respondents noted that they wished to preserve open space, however, they preferred the open space to be located in the beach area. Concerning the regulations in the Woods, the respondents appeared to be satisfied. 63% felt that the regulations were adequate: 29% felt they were not strict enough.

With regard to the Town's own property in Nags Head Woods, the respondents showed a strong preference to the two lowest intensity uses (natural state and walking paths).

TABLE 18

Uses of Town Property in the Woods	Preferred Use	
	#	%
Leave in natural state	128	43.9
Use for low intensity recreation	96	33.7
Use for moderately intense recreation	43	14.7
Use for high intensity recreation	16	5.5
Sell it	8	2.7

#### Funding Priorities:

In the final section we asked the respondents to review their earlier decisions concerning projects they desired to fund. We asked them if they still desired to fund the project and what priority (in terms of other projects they desired to see funded) they wished to give their selection. As before, we ranked the score using 4 points for first choice, 3 for second, 2 for third, and 1 for fourth.

TABLE 19

Possible Project for Funding	1st	2nd	3rd	4th	Total	Wt. Score
Pave local roads	33	22	28	17	100	271
Improve water system	77	63	20	15	175	552
Build public sewer system	57	48	31	5	141	439
Build public transit system	2	9	13	10	34	71
Build recreational facility	7	12	14	14	47	106
Build regional hospital	30	17	30	20	97	251
Build beach access/parking	49	53	33	20	155	441
Purchase open space	27	33	20	17	97	264

Since a score above 145 on the total column indicated close to majority support for funding (similarly a score of 435 would mean that a majority of the persons would have ranked the project as first or second in importance), we felt there was strong support for building a public water system and beach access and parking facilities. We felt there was marginal support for building a public sewer system; however, this group feels very strongly about the importance of this decision as noted from the high weighted score and the number of times it was chosen as first project to be funded. The biggest surprise is the willingness to purchase open space.

If we contrast funding priorities of the permanent residents with the non-resident real property owners and others, we notice that the priorities shift to local roads and perhaps public sewer.

TABLE 20

Possible Project for Funding	Total Times Selected	% of Times Selected By Residents/All
Pave local roads	36	36
Improve water system	22	12
Build public sewer system	32	23
Build public transit system	15	44
Build recreational facility	17	36
Build regional hospital	22	28
Purchase access/parking	41	26
Purchase open space	24	25

A total score of 38 or above would be needed before one could be assured of the support of the majority of the local residents. Also, since the permanent residents constituted 28.4% of the total survey, a % score of above this amount would mean they supported the facility to a greater extent than did the whole sample.

63% of those who responded indicated that they would be willing to spend over \$50 per year in fees and taxes to have the project they selected as most important built. In light of our own experience with similar type questions, we feel this is a significantly high response.

Comment

The questionnaire is designed to assist in decisionmaking and not simply to control decisionmaking. The results of this survey were followed fairly close in the decisionmaking.

A profile of the economy and age of the residents and property owners of Nags Head is discernable from the background of the respondents. (Questionnaire, p. 2) 72% of the Town describe their relationship to the Town to be that of a beach user, 35% sportfisherman and about 15% commercial businessmen. 61% of the population is over 50 years of age, about half of these are retired.

The permanent population resides largely in South Nags Head. Obviously the principal business of the Town is tourism and especially that related to beach use and sportsfishing.

## CHAPTER III

### ENVIRONMENTAL CONSIDERATIONS RELATING TO WATER AND SEWER (WATER AND SEWER ANALYSIS)

Although a municipality may be under tremendous growth pressures, it may not be able to accept that growth. The capability to accept growth may be limited by the availability of vacant land in its jurisdiction, its willingness to rebuild at higher densities, or the population it can accept without environmental damages reaching unacceptable levels. In this section of the land use plan we would like to examine capacity limitations related to environmental degradation. First, we will discuss the capability of the soils for handling wastes from development using septic systems. Next, we will examine water quality in the Albemarle Sound and the Groundwater System. Third, we will analyze the relationship between the use of septic systems and sound and groundwater quality. Lastly, we will look at the costs of treatment alternatives.

#### Soils

The soils in Nags Head are generally unsuitable for septic systems. However, even accepting this conclusion, we still must note that there are varying degrees of unacceptability. The mapping of soils presented in this plan follows the recommendations of the Soil Conservation Service as to the capacity of various soil mapping units. A typical profile of soil units in Nags Head looks as follows:

TABLE 1

Location	Soil Unit	Depth	Perm.	Use
Frontal dune	Beach-foredune assoc.	0-6'	Rapid	VSevere
Beach road east	Newhan fine	6'	VRapid	Slight
and between	Newhan Corolla	(See qualification)		
highways	Duckston fine sand	1-2'	VRapid	Severe
Bypass west	Duneland	6'	VRapid	Severe
	Duckston fine sand	(See above)		
	Newhan fine sand	(See above)		
	Corolla fine sand	1-3'	VRapid	Severe
Soundside	Carteret soils	0-3'	Rapid	VSevere

(Note: "Depth" refers to depth to seasonal high water table; "Perm." refers to permeability; "Use" refers to suitability for septic tank and filter field; "V" before Rapid and Severe means "very." Soils graded as severe or very severe were judged unsuitable for septic systems and so mapped.)

In conclusion, we found that the soils that were most suitable for septic systems were found between the bypass and the frontal dune. However, even the more suitable soils pose special problems due to their extreme permeability which will allow effluent to be injected into the shallow aquifer.

By overlaying the map showing past residential growth with the map showing soils suitable for septic systems, we notice that the past growth utilized many of the more suitable soils and that future growth will probably utilize many of the more severe and very severe soils. Furthermore, past growth has occurred at distances farthest removed from the sound. (See maps on soils and development.)

#### Quality of the Albemarle Sound

The Albemarle Sound system includes (for purposes of this discussion) not only the Albemarle, Currituck, Roanoke and Croatan



Sounds, but also the estuaries and associated drainage of the Roanoke, Chowan, Perquimans, Little, Pasquotank, North, Alligator and Scuppernong Rivers.

The Albemarle Sound is drowned river valley estuary. It has no direct outlet to the ocean but connects to the Pamlico Sound and Oregon Inlet through the Croatan and Roanoke Sound. Tides ranges are of small magnitude in most locations; winds play a major role in water circulation. The Sounds average dimensions are 55 miles by 7 miles. The central area of the bay is about 18 feet deep.

The Sound and its tributaries have proven to be exceptionally favorable habitats for anadromous fishes such as striped bass and herring and serve also as nurseries and commercial and sport fisheries for a variety of shellfish and finfish. Dissolved oxygen is abundant in the sound year-round. The percent oxygen saturation is usually above 80 to 90 percent. There are few signs of eutrophication although nutrients necessary for algae blooms are abundant. Algae blooms and attendant fish kills have occurred in the Chowan River. The lack of algae growth is probably due to low temperatures, insufficient light and washout in the winter and high turbidity in the summer.

Considering freshwater inflow and saltwater intrusion, we note that the large drainage basin and the strong currents are making the Sound increasing fresh water. The water budget for the Sound is as follows:

TABLE 2

Element	Drainage	Average Monthly Values in ft. <sup>3</sup> /sec.			
		March	July	December	Ave.
Precipitation	933 mi <sup>2</sup>	2900	5400	2600	3400
Inflow: Chowan	4943	8600	3000	4400	4600
Inflow: Roanoke	9666	10000	8000	8300	8900
Inflow: land	2817	5600	1900	1300	2900
Less-Evaporation	933	2200	4100	900	2600
Total Outflow to Pamlico	18359	25000	14000	16000	17000

The salinity of the Sound is usually at a minimum in March as a result of heavy spring runoff displacing saline water seaward, and is at a maximum in December, after relatively low freshwater inflows during the summer have allowed saline water to again advance landward. Wind tides prevent salinity stratification in the open sound. Typical salinity values appear as follows:

TABLE 3

Location	Salinity in Grams Per Kilogram	
	December	March
Hertford to Columbia area	1	1
Elizabeth City to Alligator R.	3	2
Roanoke and Croatan Sounds	8	4
Near Oregon Inlet	18	11
(Sea water)	34.5	

Although as a whole the Albemarle Sound is biologically healthy, there are many potential water problems. Some areas have been closed to shellfishing due to high coliform bacteria counts. There have been several very destructive algae blooms. Large agricultural developments,

including livestock operations, will increase nutrient loads. Drainage canals may lower salinities below that necessary for developing shellfish. High levels of mercury and metals may damage the marine life.

The control over potential problems in the Sound rests in a collection of overlapping government controls. The Commission of Health Services sets standards for use of septic systems which are enforced by the County Health Department. The CHS makes regular reports on the quality of shellfishing. The Environmental Management Commission sets standards for wastes and water quality parameters. The EMC monitors water quality in each of the river basins discharging into the Sound. the counties and the municipalities therein are responsible for controlling land use and among other things for preventing high density development on unsuitable soils adjacent to the sound. Although man-made pollution from industry, commerce and residential development can be controlled by some layer of government; agricultural uses have been exempted by the State from almost all direct and indirect control.

In their 1979 Water Quality Management Plan, the N.C. Department of Natural Resources and Community Development noted that it is highly probable that many streams and coastal waters are degraded but undetected at this time due to a lack of water quality monitoring. DNRCD is concerned with several water pollutants, namely oxygen demanding substances, bacteria, sediment, nutrients and toxics. Wastes from all sectors of development pose demands on oxygen in the water--an essential to aquatic life. Generally a level of 5 mg/l of DO is required to sustain acceptable biological activity. Pathogenic bacteria can be found in both domestic wastewater and runoff from

animal feedlots. Pathogens which are most frequently transmitted through water are those which cause infections of the intestinal tract, namely typhoid, and paratyphoid fevers, dysentery and cholera. Livestock operations may cause bacterial contamination of shellfish. Also extensive ditching (agricultural, construction and residential) can cause bacteria to enter estuaries. Coliform bacteria standards for different classes of waters are as follows:

TABLE 4

Class	Standard (Colonies/ml.)
Class A-1 waters	50/100 ml
Class A-2 waters	1000/100
Class B and SB waters (fecal)	200/100 ml
Class C and SC waters (fecal)	1000/100 ml
Class SA waters	70/100 ml

As we noted before sediment loads have served an important function in the Sound, especially by interfering with photosynthesis and preventing algae blooms despite ample presence of nitrogenous materials. Sedimentation in the coastal area is largely the result of erosion from agricultural use (estimate of 80% from cropland, pasture, farmsteads, farm roads) and urban use and construction activities. Sediment in sound and streams disrupts the food chain. At moderate concentrations, fish cannot spawn; at high concentrations, gills of fish clog and they die. Sediments cover up bottom dwelling macroinvertebrates which are the primary source of food for fish. Fish may starve or move away. Nutrients (phosphorus and nitrogen) are required by plants in order

to grow. However if these levels become too high, algae blooms may occur. Excessive nutrient inputs may occur wastewater discharges, septic tank leakage and rainfall runoff from agricultural and residential areas. As was noted before, algae blooms have occurred in the Chowan River estuary. It was estimated that 85% of the nitrogen delivered to the Chowan came from non-point sources. The State uses "Chlorophyll a" to measure the amount of nutrients in the water. The proposed standard for salt water sounds is 40 ug/l.

Toxic substances reach the surface waters from wastewater discharge or runoff from agricultural lands or urban areas. These substances include those whose discharge is immediately dangerous to biological organisms (causes death) and those that interfere with biological processes over long periods of time (reproductive damage). Toxic substances can reach groundwater from ponds and lagoons. Mercury and zinc levels in the Chowan River estuary have exceeded existing and proposed standards. (Mercury standard .05 ug/l fresh water and .1 ug/l salt water.)

#### Groundwater System

In the Nags Head/Kill Devil Hills area there are six significant hydrogeologic units above a depth of 500 feet. These units include three aquifers and three confining units known as aquatards or non-aquifers. The uppermost unit is a water table or "unconfined aquifer" which consists primarily of sand with some shells and some interbedded clays and silty sands. The aquifer extends from the land surface to about 100 feet of Bodie Island. This aquifer is the source of water for many existing and commercial wells in the area. The uppermost

confined layer is the most significant aquifer in the region. It has been designated as the principal aquifer in the region. It has been designated as the principal aquifer by the Groundwater Division of the State DNRCD. The top of this aquifer is at about 200 feet at Nags Head/Kill Devil Hills and is about 45 feet thick. This aquifer appears to be more than adequate to meet the needs of the area for the foreseeable future.

Because of the high degree of permeability of the aquifer in most of the area, it has been largely flushed of saline water. The aquatards above and below the aquifer provide good protection from the encroachment of saline water. Rainfall on the mainland appears to be the source of recharge where the confining bed above the aquifer is absent, thin, or relatively permeable. DNRCD data suggest that the major center of recharge is on the west side of the Croatan Sound where the confining bed possibly terminates, and where the permeability and transmissivity of the aquifer are highest. From the recharge area the water moves beneath the Sound towards Roanoke Island and the beaches.

The Towns of Nags Head and Kill Devil Hills and the population center on Collington Island currently derive their water supply from a surface freshwater lake called Freshwater Pond located on the border of Kill Devil Hills and Nags Head. The waters of this pond are approximately 35 acres in size and are supplied by the upper unconfined surface aquifer.

Water Quality of Surface and Groundwater System  
Immediately Adjacent to Dare County Beaches

Water quality classifications immediately adjacent to the Dare beaches vary from SA to SC. SA waters are suitable for shellfishing.

SB for bathing and recreation and SC for fishing. According to a report prepared for the Army Corps of Engineers by Enviroplan, Inc. in 1975, Shallowbag Bay is a spawning area for finfish, crabs and oysters and a nursery area for shrimp, primarily in the vicinity of Scarborough and Dough's Creeks. The N.C. Wildlife Resources Commission in 1976 reported that Buzzards Bay, Kitty Hawk Bay and Collington Creek all offer good fishing for large mouth bass, white perch and yellow perch. Other reports cite that the shallow freshwater marshes cover 2000 or more acres bordering Kitty Hawk bay and Buzzards bay. These areas are important as a nursery area for freshwater game fish. The areas adjacent to Nags Head and Kill Devil Hills (including Collington community) contain extensive wetland areas and are located within a rich estuarine complex.

Regretably a large portion of this area is now closed to shellfishing. In 1973 crabkills were cited in Kitty Hawk Bay and Collington Creek. High fecal coliform counts (in excess of 300 in many stations during March, in excess of 70 in summer) has resulted in the areas being closed to shellfishing.

#### Causes of Shellfish Closings

Due to the relatively small amount of land in the area in agricultural use, this use is not considered to be a significant cause of pollutants. A number of point sources in the Nags Head/Kill Devil Hills area discharge to the surface or the Sound. They are as follows:

TABLE 5

Package System	Capacity (MGD)	Flow (MGD)
Holiday Inn (subsurface)	.03	.03
Evans Seafood (subsurface)	.01	No data
Villas	.06	.05
Ocean Acres	.06	.08*
Ramada Inn (subsurface)	.03	.03
Sells Association (subsurface)	.007	NA
Cove Condominium	.03	
Sea Scape Development (subs)	.08	
Dunes Condominium (subsurface)	.03	
Daniels Seafood	.02	

With the exception of Ocean Acres, these point sources have not been considered as a significant cause of the pollution.

The Town of Manteo operates a .25 MGD secondary treatment facility which discharges into Shallowbag Bay. The facility is meeting secondary wastetreatment requirements for BOD removal and suspended solids. Despite meeting standards of EPA, this facility is still a major contributor to pollution in the Bay. (Shallowbag Bay is closed to shellfishing because of fear concerning a breakdown in the facility.)

The major cause of pollution in the Sound adjacent to the Dare County beaches has been attributed to septic tank failures. Septic tank failure is not limited to those that are cited for malfunctioning. In January 1979 45 of 459 private sewage disposal systems examined needed repair. Similar septic tank failure rates were documented in the past. Health department statistics indicate 53-68 septic systems are condemned each year and 104-115 are in need of repair or replacement.



The major cause of pollution in the Sound adjacent to the Dare County beaches has been attributed to septic tank failures. Septic tank failure is not limited to those that are cited for malfunctioning. In January 1979 45 of 459 private sewage disposal systems examined needed repair. Similar septic tank failure rates were documented in the past. Health department statistics indicate 53-68 septic systems are condemned each year and 104-115 are in need of repair or replacement.

Other causes of pollution, especially fecal coliform count, may be from the duck and geese population in the Roanoke Sound, estimated by CHS to be approximately 42,100 in January 1979.

#### Septic Systems, Sound Quality and Land Use

Although a satisfactory model that would predict when septic tanks would cause the pollution of adjacent waters has not been developed, many studies point to some rather obvious conclusions. In Nassau County, New York a population density of 2000 persons per square mile has resulted in nitrification of surface and ground waters. In New Hanover County monitoring was performed on four tidal creeks to assess the impact of septic systems. Residential development on the creeks ranged from heavy (Whiskey and Bradley) to almost non-existent (Futch). Bacteriological and nutrient samples were obtained from these creeks during the period July to October 1978. Results showed the following:

TABLE 6  
MONITORING RESULTS IN NEW HANOVER COUNTY

	Whiskey Creek	Bradley Creek	Futch Creek
Fecal Coliform	196	228	21
Total Coliform	3970	2452	66
Septic Tank Density (units/acre)	.367	.563	.036
Soils Rated Severe (% of study area)	78	70	10
Distance from water	(Closer in Whiskey Creek than Bradley)		

In still another study on the Surf City area, the State DNRCD was able to conclude that fecal coliform survives in the soil in significant numbers for 32 days. In addition these colonies will travel tens of feet per day in soils. A range of up to 1000 feet may be possible.

The relationship between septic systems and high fecal coliform counts in adjacent water areas is also apparent from studying the CHS reports for waters adjacent to the Outer Banks. Areas south of the Washington Baum bridge to Ocracoke are basically unpopulated except for small communities on septic tanks. With but one exception (where there was cited a natural cause) the reports document that fecal coliform counts in excess of State standards are found where there is residential housing using septic systems. Interestingly, the highest fecal counts are found in the spring when the population is low but the land is wet and water table high, than in the summer.

In conclusion, septic systems (even when from a layman's perspective they are functioning properly) are a cause of pollution (fecal coliform and nutrients) in nearby water bodies. This

relationship appears to depend on the quality of the soils to remove bacteria, the distance of the system from the watercourse, the density of the systems and the capacity and quality of the system. The location of past population adjacent to the ocean ( as opposed to the sound) has probably protected the sound from pollution. However, future development pressures will undoubtedly open up areas close to the Sound.

The level of fecal coliform will probably be directly related to the amount of development on septic systems on poor soils. The problems with high fecal coliform counts is not solely the elimination of shellfish as a source of sport and commercial food for man. Shellfish are collectors of bacteria and viruses. They are also part of food-chain for finfish. In addition, high fecal coliform counts may eventually close the area to finfishing and bathing as well.

#### Septic Systems and Groundwater Quality

Effluent from septic systems threatens to pollute the unconsolidated aquifer. Although this may not appear to be significant, studies have expressed some concern that contamination may pass through the aquitard and affect the quality of the principal aquifer--the sole water source for the region.

#### Sewage Treatment Alternatives

Several alternatives exist to the present handling of septic systems. Among these are: decrease density on areas with poor soils, decrease population in general, provide generous setbacks of septic systems from the sound and canals, increase the vertical separation to as much as 30 inches. (Vertical separation is the distance between the nitrification lines and the top of the water table.)

Alternatives to septic systems themselves include mounds, evapotranspiration beds, low pressure pipe, aerobic systems, land application and holding tanks. The alternative to the individual private system is a municipal, community or regional system. In 1977 Von Ossen studied four alternatives to a regional system for the Dare beaches. The alternative adopted by resolution by all municipalities concerned at that time involved a one plant system with ocean outfall.

The proposed waste treatment facility will have a design capacity of 3.4 mgd. This was based on a regional peak population of 37,200 people in 1980. Based on our studies of water use and population, we feel that the system would be capable of handling 52,300 people. The projected summer population (average, not peak) for 1990 shows 32,200 for Nags Head and 29,000 for Kill Devil Hills. Von Ossen projected 33% for other areas in the service region. Clearly, given current rates of growth, the 1990 population of the service area will approach 90,000 people.

An analysis of the approach used by the federal agencies in designing this facility leaves no conclusion but that it was designed to fail upon completion. The system was designed with the inference that it would be used as an ultimate growth control tool. Intentions appear to be that the system would be at real capacity upon completion and that further hookups would be prohibited. Since the system appears designed to fail, it seems important to understand the environmental costs attendant upon the failure of the systems to be able to handle the effluent being delivered to the plant. Here we must recognize the distinction between design treatment capacity and flow

capacity. A second alternative would recognize that to avert failure the municipalities could provide for additional capacity. This could be done either now or immediately upon completion of the plant. If it were done now, federal agencies would probably demand that an EIS be completed. If it were done (say in 1986 following completion) the entire costs of the addition (less perhaps 25% State share) would be borne by the municipalities. A third alternative would recognize a redesign of the plant in light of realistic population projections and with perhaps a modification of federal policies towards the barrier islands.

We would like to point out an interesting legal aside at this point. Although there is no case law in North Carolina on point, case law from other jurisdictions points to two conclusions; one that the State can enjoin a municipality from adding on additions to a plant that is operating with loads excess of its NPDES permit; secondly, a developer or private individual can enjoin a municipality from keeping him from making a hookup to a wastetreatment system, even where it is under restrictions by EPA or the State. In conclusion, this puts the municipality between the proverbial "rock and a hard place." (See *Westwood Forest Estates, Inc v. Village of Souty Nyack*, 23 N.Y. 2d 424 (1969) and *Charles v. Diamond*, 42 A. 2d 232 (1973).

TABLE 7  
COST ANALYSIS OF ALTERNATIVE SYSTEMS

System	Cost	Comment
Mound System	\$2500.00 (capital)	A raised septic system Aesthetic considerations
Evapotranspiration Bed System	\$2500.00 (capital)	Unsuitable during wet season when MPN high
Low Pressure Pipe System	\$1500.00 (capital)	Unsuitable where high water table
Aerobic System	\$5000.00 (capital)	Need expert maintenance
Land Application	NA	Need large land area; does not treat nutrient

From information supplied by Ocean Acres, one of two package facilities operating on the Dare beaches and serving a large number of residences, we concluded that the costs of such systems may have increased so substantially as to be extremely expensive, at least when compared with the regional systems. Because of a parking law suit with the State involving costs, we felt it inappropriate to detail this information.

#### Regional 201 Facility

In 1977, Henry Von Ossen and Associates completed the Dare County Complex 201 Facility Plan which provided for the construction of sewage disposal facilities for the Northeastern portion of the County comprised of the Dare Beaches region north of the Oregon Inlet. Alternative A which called for a joint project by the municipalities of Kill Devil Hills, Nags Head and Manteo (together with unincorporated areas of Dare County) was chosen by all participants.

The total capital cost of the project in 1975 dollars was estimated at \$10,611,560. It is anticipated that EPA will fund 75% of the project in the amount of \$7,482,407. The State of North Carolina will fund 12.5% of the nonfederal portion of the marine site survey for the ocean outfall and an additional 12.5% of the capital costs. The participating governments will have to fund 12.5% of the non-federal share. The annual costs for debt service, operation and maintenance will be paid for by means of user fees. It is anticipated that the local share of the marine site survey will be paid out of the general funds of each municipality. The collection system will be provided totally out of local monies.

TABLE 8  
PROJECT COST 1980 DOLLARS

<b>Capital Facility and Interceptors:</b>		
Total Project Cost		\$17,090,024.00
Less: EPA Grant (75%)	\$12,817,518.00	
Water Bond (12.5)	2,136,253.00	
Local Share of Capital Costs		2,136,253.00
Annual Debt Payment (FMHA loan at 5% for 40 years)		123,903.00
Annual Operating and Maintenance		417,815.00
Total Annual Cost		541,718.00
Monthly local costs		45,143.00
Average Monthly Cost Per User (Based on 11,000 units)		4.10
<b>Collection System:</b>		
Total Project Cost		\$ 6,000,000.00
Less: Water Bond Grant (25%)	500,000.00	
Connection Fee (\$250)	916,667.00	
Local Share of Costs		4,583,333.00
Annual Debt Payment		304,500.00
Annual Operating and Maintenance		50,000.00
Total Annual Cost		354,500.00
Monthly local costs		29,547.00
Average Monthly cost per User		7.00
Total Monthly User Cost		11.10
Plus one time installation fee of \$250.00		

(Note: This is an estimate designed to assist in government decision-making. All costs are reliant on information supplied by engineers and others with adjustments to account for 1980 dollars. Thus costs are only adjusted for inflation and the cost of money, not real appreciation or increase in goods and services. To adjust to 1985 dollars multiply by a reasonable interest rate compounded annually.

#### Dare County Regional Water System

Although at the present time, Nags Head is still relying on the Freshwater Pond for its water supply, the Dare County Regional System is expected to be the supplier of water prior to the beginning of the summer season. The Dare County Regional System is expected to have a 5 MGD design capacity in 1980, with a 1990 design capacity of 8.4 MGD. This should be more than enough water to meet the need of Nags Head residents to 1990.

The present distribution system contains several undersized lines and dead end lines which are the primary cause for the low pressures. They will probably cause problems in meeting residential and commercial water usage demand even though the capacity at the source has been (or will be) increased.

In order to accommodate the increased supply of water available for distribution Nags Head will install a 24 inch regional transmission main as the backbone of the system. Additional ground storage will also have to be provided. Capital Costs for bringing the local system to capacity to handle the County Water System were estimated by Williams and Works at \$3,351,000.00 (in 1978 dollars).



TABLE 9  
WATER SYSTEM ADDITIONS

Total Costs of Water System (1980 \$)	\$4,021,200.00
Less: Clean Water Bond Grant	\$1,005,300.00
Local Share	2,994,700.00
Annual local share	173,693.00
Annual Operating and Maintenance costs	31,650.00
Total annual cost	205,343.00
Monthly cost	17,112.00
Cost Per User (1980) (1500 users)	11.41

In conclusion, Nags Head and Kill Devil Hills rely on groundwater system, especially the surficial aquifer, for their drinking water. This part of the aquifer is sensitive to groundwater pollution, especially from septic tank effluent. The ability of soils to remove wastes from the septic systems varies with soil type. Nags Head has a considerable amount of poor soils with limited capacity in this regard. Because the regional water system is expected to be in operation very shortly, the Town's reliance on surficial aquifer will be relegated to only a back-up for the regional system which will use the "principal aquifer."

When the regional system (water supply) is operating, the Town's major concern with wastes placed in or on the ground will be with the effect such wastes will have on animal and plant life, especially in those areas where such life is significant and/or of high quality and where the wastes would endanger the survival of the species. The two most environmentally significant areas are the freshwater and the sound. These systems both center around water quality. Nutrient loads (from septic systems) could make demands on dissolved oxygen, removing it from the water. Without sufficient oxygen most plants and animals cannot

survive. The Town is currently using land use controls, setback, and minimum lot size, cut and cover requirements to protect the fresh water ponds in Nags Head Woods. CAMA requires similar attention within areas around the largest pond used for water supply.

In order to protect the water quality of the sound, the Town must limit nutrients and pathogens from reaching that water body. Studies on the movement of pathogens show that they can travel up to tens of feet per day and live for 30 days in poor soils. Pathogens are directly related to shellfish closings.

If pollution of the sound is unacceptable, which the Town has decided it is, then the alternatives are either to restrict growth to a limit (density) that will not cause pollution (density was one of the factors cited as a function of pollution in Nassau and New Hanover studies) or to technologically remove the limitation, by building sewage treatment facility (regional or several small package facilities) or using mounds, aerobic systems, etc. The most cost efficient, technological alternative appears to be a Regional 201 Facility. (Small package plants operated by the municipality need additional study.) The Town has decided to limit development on poor soils (for septic systems) within 500 feet of the sound as an interim measure until a technological approach is adopted.

Sources for information in this section:

### Soils

Soil Survey of the Outer Banks, North Carolina. U.S. Department of Agriculture, Soil Conservation Service. June 1977. Part I discusses soils and limitations. Part II presents soils mapping units.

### Quality of Albemarle Sound

Hydrology of Major Estuaries and Sounds of North Carolina. U.S. Geological Survey, Water Resources investigations, by G.L. Geise et al., 1979. (especially Chapter IV, pp. 129 ff.)

Bowden, W.B. and Hobbie, J.E. 1977, Nutrients in the Albemarle Sound, North Carolina: University of North Carolina Sea Grant publication 75-25.

Water Quality Management Plan of North Carolina. DNRCD, Division of Environmental Management, 1979.

Water Quality Inventory, North Carolina: 305(b) Report. DNRCD. 1979 (especially sections on Chowan River)

### Groundwater System

Heath, R.C. Hydrology of the Albemarle-Pamlico Region, North Carolina, 1975.

Nelson, P.F. Geology and Groundwater Resource of the Swann Quarter Area, 1964.

Peak, H.M. Potential Groundwater Supplies for Roanoke Island and the Dare County Beaches, North Carolina, 1972.

Dare County Complex, 201 Facility Plan. Henry Von Oesen and Associates, 1977.

Water Quality

See DNRCD and Von Oesen reports cited above.

Septic Systems

See DNRCD report. Section: Water Quality and On-Site Wastewater Disposal.

Report of Sanitary and Bacteriological Surveys, Roanoke Sound Area, 2/77-10/78, 1/15/79. (See especially Reports H1, I1 & 2, I16)

Waste Source and Water Quality Studies, Surf City, N.C., U.S. Environmental Protection Agency, 1975.

An Analysis of Septic Tank Problems and the Vertical Separation Issue in the Coastal Zone of North Carolina, Joseph H. Prater, III.

Conversations with Al Duda, J.F. Smith, Roy McCarter

Sewage Treatment Alternatives

See Von Oesen report cited above.

See also Prater report cited above (alternative systems).

Conversation with Robert Burnett of Von Oesen and Associates

## CHAPTER IV

### OTHER ENVIRONMENTAL CONSIDERATIONS: CONSTRAINTS

#### A. BEACH DYNAMICS

Scientists believe that the Outer Banks were a product of the rising sea elevation during the last ice age. Basically, as the sea level rose, the shoreline retreated until the shoreline was out near the continental shelf. Then, a ridge of sand dunes began to appear parallel to the beaches, formed by wind and tide. The beach received sand from the continental shelf through wave action. As sea level rose, dunes were breached and the area behind the ridges became flooded--the dunes became islands. Since then, both the mainland and the islands have migrated. Migration is related to sea level rise and the slope of the mainland. Accordingly, the horizontal island migration rates should be 100 to 1,000 times the rate of sea-level rise (namely 1 foot per century). The rate of migration is higher in the northern Outer Banks than the southern. The North Carolina coast experiences a much slower migration than we find in New Jersey or Maine.

The process of migration is not uniform, although most of the ocean beaches are eroding. The back sides of the islands can widen. The principal ways in which islands widen are (1) inlet formation and the forming of tidal deltas and (2) overwash. The maintenance of the bulk

of the island is through vegetation and retention of the sand. Habitation and the natural process favoring island stabilization are at odds--development seems to require stabilization of inlets, prevention of overwash and reduction in vegetation.

The methods used to stabilize the ocean beach include: (1) beach replenishment (2) groins and jetties and (3) seawalls.

Beach replenishment involves pumping or plowing sand onto the beach and building up the former dunes and upper beach. According to Orin Pilkey, most beach replenishment projects involve only the upper reaches of the beach--since they increase the slope of the beach, they increase the rate of erosion. Most sand for beach nourishment is taken from the sound, thus often increasing erosion on the beach side of the island. The costs of replenishments are high (over \$1 million to replenish Wrightsville Beach in 1966) and the results very temporary.

Groins and jetties are walls built perpendicular to the shoreline. Jetties are often very long and intended to keep sand from filling in shipping channels. Groins are smaller and attempt to trap sand flowing in the littoral current. Although both are effective sand traps, they both work on the principle of "stealing from Peter to pay Paul," i.e., beaches upcurrent and downcurrent from groins will erode as the groined beach accretes.

Seawalls are built back from and parallel to the shore. Seawalls reflect wave action, and intensify currents steepening the profile of the beach. The long-range effects of seawalls can be seen in New Jersey and Florida. Pilkey relates a story of Cape May--once a sandy beach resort of pre civil war presidents and the country's most prestigious beach, now beachless, blockaded by a mile-long crumbling stormwall--a

# NAGS HEAD

LANDMARK



EROSION FACTOR  
IN FEET

KDH TOWN  
LINE

2

IN EPSTEIN  
TRACT

4

WINJAMMER  
(SOUTH OF)

2

ARMADA INN  
(SOUTH OF)

4

PIER (SOUTH  
EDGE)

6

PARK LAND  
(NORTH OF)

OCEAN  
ATLANTIC

PRODUCED FROM DATA

PREPARED BY L. PRIDDY  
G R. CARRAWAY 2/80.  
G R. DOWAN

community nearly "financially insolvent" and in fear of being submerged by the tide.

The Dare County Beach from South Nags Head to Kitty Hawk has recently experienced severe erosion in several spots following northeastern storms in late winter. This year, several houses were damaged as their foundation gave way on steep escarpments. Several others have been moved back from the ocean to prevent damage. See following page for erosion rates.

The ability to withstand a hurricane will to a large degree be a function of the moss in storage in the frontal dunes and the provision for overwash. Overwash areas are necessary to replenish the marshes and reduce the pressure on the dune system. On the other hand, a solid (high and broad) dune system is necessary to protect beachfront and nearby low elevation cottages. Prior to 1977, a large number of developments in Nags Head and Kill Devil Hills had removed primary dunes in front of their businesses and cottages. These areas and others where sand has moved following sand disturbance and lack of vegetation are in danger of becoming overwash areas and breaking points in a hurricane. Although future oceanfront developments are prevented by CAMA from disturbing the frontal dunes, the many already existing problem areas need to be identified and repaired.

Finally, areas that are extremely low in elevation are subject to overwash during a hurricane. This problem is aggravated to the dimensions of inlet formation possibilities where channels have been dug parallel to the sound, with the land contour on a narrow stretch of the island not protected by tidal deltas and marshlands. One such potential inlet can be readily identifiable, namely The Cove. Damage from inlet formation in this area could be more significant than the extreme loss



of property (several hundred homes are built in the subdivision and several hundred more possible). Losses could include separation of Northern Nags Head and Kill Devil Hills from Dare County Mainland, with attendant costs for new transportation to Manteo. It would seem prudent to explore possibilities for filling in the canals. (We should note that canals are frequently blamed by scientists for causing pollution of estuarine waters--each lot is technically within short distance to sound).

In terms of building on the Dare beaches, we recommend identifying and preserving several overwash areas, building up and vegetating the dunes. Secondly, we feel that those uses that are least likely to result in the necessity of a seawall to protect investment should be encouraged within 100 feet of mean high water on ocean. Also, uses that are allowed within the first 200 feet should involve an amortization of the use, such that the use will not remain after a certain time calculated to include the beach's migration. Thirdly, we concur with Pilkey in his recommendation that development be placed back from the shore, behind the dunes and on high ground.

B. AREAS OF ENVIRONMENTAL CONCERN:  
TYPES, STANDARDS, USES

Areas of environmental concern (AECs) are areas designated by the State to be of special environmental or natural resource concern so as to warrant protection of the resource or of man from the resource. Nags Head has several AECs; other areas could qualify for nomination. AECs are protected through State permit leasing (the CAMA permit: the minor permit is issued by Nags Head under an IGE Program for activity or development in the ocean hazard and estuarine shoreline AEC; the major permit is issued by the State.) In any event, each AEC permit must follow the general standards set out in the statute as well as regulations developed to guide development in the designated area in accordance with the management objective. The statutory standards require development within AECs to be consistent with the land use plans.

Among the AECs in Nags Head are the ocean erodible area, the V zone or flood zone, the estuarine shoreline area, the wetland and the fresh water ponds. The first three are part of the Ocean Hazard AEC, the next two of the Estuarine System AEC. The ocean erodible area is a safety zone and intended to prevent further development in areas which will probably be under water in the next 30 years. The zone protects persons from building foolishly; it also may protect persons living outside the eroding area from being damaged by those in the area. The area is measured by multiplying the average annual erosion rate times the estimated life of the structure, 30 years. This measurement ranges from 60 to 300 feet, with the greatest rates in South Nags Head.

The V zone is the flood hazard zone as determined by the Federal Flood Insurance Program. This is the area likely to be inundated by the 1% storm. This area has been depicted on the Flood Hazard Map; it follows the crest of the frontal dune where the elevation exceeds 15 feet on the ocean front; otherwise it reaches to SR 1243. Development is restricted in this area to design standards set out in CAMA regs, oversimply to building above flood elevation and with 8" diameter pilings to a depth of 8 feet into bedrock.

The estuarine shoreline zone extends from estuarine water (mean high water mark) to 75 feet. The major concern of this zone is for protecting the estuarine system from pollution--both sedimentation and nitrification. Regulations severely limit the use of septic systems and removal of ground cover.

The wetland zone is defined by the presence of commonly found vegetation, particularly spartina and juncus.. The wetlands are recognized as important to the food chain and the estuarine system. They are protected from development through limits placed on filling. Water related activities such as marinas are restricted by dredge and spoil placement requirement.

The fresh water pond is a municipal water source for both Nags Head and Kill Devil Hills. In order to maintain the quality of the source, the State has designated the area as an AEC and regulates development to prevent contamination of the water. Regulations require a setback and density requirements not be exceeded in the use of septic tanks.

The full management objective together with the regulations are set out in the State Administrative Code at 15NCAC7H. Further information can be obtained from the CAMA permit officer for the Town.

AECS and Land Use Plan

An overlay of the zoning ordinance with the AEC map shows that in the Ocean Erodible Area the following zones occur: CR, R1, R2; in the Flood Zones (other than V) the following: R3, C, C2, SPD, R2, CR; in the Wetlands AEC the following: SPD40, C, C2; in the Estuarine Shoreline Zone, the following: SPD40, SPD, C, C1, C2, R1, R2. The uses for the zones are: SPE (Special Planned District Development) single family (detached and clustered), churches, schools, museums, wildlife refuges, watershed conservation areas, public and outdoor recreation, sewage treatment facilities; C1--(neighborhood commercial) food market, banks, drugstores, post office, barber shop, laundries (with condition uses for public utility facilities, seafood markets and fishing piers; C2--(General Commercial District) offices, primary and secondary retail stores, and service establishments, single family dwelling, multifamily dwelling and duplexes (with conditional uses for auto service stations, public utility facilities and outdoor entertainment activities); R3--(High Density Residential)--multi-family dwellings, duplexes, detached single family dwellings (with conditional uses for churches, cemeteries, townhouses, parks, golf courses, home occupations, hospitals, medical clinics, nursing homes, private club or lodge, public buildings, public utilize facilities, mobile home park, cottage courts; R2 (Medium Density Residential)--detached single family, duplexes (with conditional uses for churches, cottage courts, fire stations, fishing piers, home occupations, private parks and playgrounds, public utility facilities; and R1--(Low Density Residential) detached single family (with conditional uses for churches, cemeteries,

fire stations, home occupations, private parks, public utility facilities. The Town notes that the zoning ordinance is more than uses, that some uses may be greatly restricted from certain areas as a result of application of development standards. These standards are summarized on page 73 of the zoning ordinance (which follows this section). The Town is not aware of any uses that conflict with AEC restrictions. The Town is not aware of any land that would be totally prevented from development in the Ocean Hazard Area. Furthermore because of the large size of the tracts, the same applies to the wetlands which are allowed to develop using density transfer under the Town's SPD district. The Plans for managing the "Woods" should strengthen the protection of the wetlands there. The Town notes that the State is not permitted to regulate land to the extent that the regulation results in a "taking" of the land.

TABLE 1 : ABRIDGED STANDARDS FOR DEVELOPMENT  
FROM NAGS HEAD ZONING ORDINANCE

	Minimum Lot Area/D.U.	Minimum Lot Width (2)	Minimum Front Yard	Minimum Side Yard (6)	Minimum Rear Yard	Maximum Lot Coverage	Height Limit
-1 Low Density Residential	15,000 sq. ft.	75 ft.	30 ft.	12 ft.	20% Lot Depth	30%	35 ft
-2 Medium Density Residential	10,000 sq. ft.	70 ft.	30 ft.	10 ft.	20% Lot Depth	30%	35 ft
-3 High Density Residential	First D.U. 7,500 sq. ft. (Ea. additional D.U. 4,000 sq.ft.)	60 ft.	30 ft.	8 ft.	20% Lot Depth	30%	35 ft
Multi-Family or Motel/Hotel	20,000 sq.ft.	100 ft.	15 ft.	10 ft.	20% Lot Depth	55% Including Required Parking	
Commercial	Sufficient to meet requirements of ap- plicable State and Local Ordinances.	50 ft.	15 ft.	8 ft.	25 ft.	55%	
-1 Neighborhood Commercial	Sufficient to meet requirements of ap- plicable State and Local Ordinances.	50 ft.	15 ft.	None Req'd. If Provided Must Be 10 ft.	25 ft.	55%	35 ft
-2 General Commercial	Sufficient to meet requirements of ap- plicable State and Local Ordinances.	50 ft.	15 ft.	None Req'd. If Provided Must Be 10 ft.	25 ft.	55%	35 ft

C. ENVIRONMENTAL AND OTHER CONSTRAINTS:  
FRAGILE AREAS AND HAZARD AREAS

In order to determine land areas suitable for development, one needs to assess the major constraints to land development. Constraints arise from a desire to protect water supplies from contamination, to preserve wetlands, to protect property (and property values), to save lives, to protect wildlife, etc. Some of these values are established by the government and some by the private sector. The following environmental factors are treated as fragile resources or hazards wherein man and nature need to be protected from one another: water bodies and water supply areas, wetlands (especially coastal wetlands, steep slopes (especially sand dunes, frontal and soundside), parks and recreation areas, woodlands, prime and unique agricultural soils, unsuitable soils for on-lot sewage disposal.

(1) Lakes and Ponds. Lakes and ponds play an important part in the hydrological cycle--the circular path which water takes as it falls in the form of precipitation, penetrates into groundwater reserves, collects in water bodies and low areas and is evaporated by the sun or transpired by plants into the atmosphere.

In Nags Head and Kill Devil Hills area the fresh water ponds in the Nags Head Woods and the wetland areas therein collect rainwater directly and indirectly from soils in nearby land areas (the Woods). Water falling onto the ground seeps into the high water table and appears (in places) to be connected to the water quality of the Fresh Water Pond, the municipal water source (at present) for Nags Head and Kill Devil Hills.

Water is a natural constraint to development. Land areas near water bodies and which drain into them directly or indirectly via the groundwater (surficial aquifer) should be a constraint.

(2) Wetlands. These areas provide a wide variety of functions. Wetlands recharge groundwater reservoirs; act as a sediment and nutrient trap in which eroded soil and wastes are filtered out naturally from water destined for human use; retain flood water during heavy rainfall; act as plant and wildlife habitats and provide the life cycle for wildlife. The wetlands on the Nags Head and Kill Devil Hills soundside were determined to be an intricate part of the Dare County economy as many species of fish and wildlife spend at least part of their life cycle there. Coastal wetlands, regulated by CAMA as an AEC, and hence constrained, are defined as any marsh subject to at least occasional flooding by the tides. Most marshland adjacent to Nags Head and Kill Devil Hills is typified by the presence of *Spartine alterniflora*, *juncus romerianus* or *scirpus* spp.

Land uses in or adjacent to wetlands should be limited to conservation uses. In mapping wetlands, we attempted to identify areas according to the guidelines and descriptions set out under Wetland AEC under CAMA. Interpretations were made from aerial photos. These interpretations were checked with other work done for the Town using different scales.

(3) Flood Hazard Areas. The cost of property loss from floods and the cost of flood protection devices are so high that flood hazard areas are best treated as areas on which industrial, institutional, residential and commercial buildings should not be constructed. If, however, this action cannot be taken, development in these areas



should be permitted only in accordance with the requirements of the National Flood Insurance Program. The boundary used to delineate the flood hazard area is the 100 year plain. We mapped both areas designated as subject to high velocity winds and storm surge and the A zone, referred to above. We note the CAMA ocean hazard zone compliments this area (its regulations are described in AEC section). Nags Head cooperates in the flood hazard program. Although flooding is a constraint that in many places prevents development, here it is not. In accordance with the flood regulations residential construction is permitted where adequate flood avoidance measures have been taken, namely living quarters must be above the flood elevation, efforts must be taken to design sewage treatment system to make them flood proof. No development is permitted in the V zone. See map of flood areas.

(4) Steep Slopes. Development on steep slopes accompanied by a disturbance of ground cover is a major cause of erosion. Almost all steep slopes in Nags Head are on the sand dunes. The dunes reach as high as ninety feet above sea level, although a number of dunes are in excess of forty feet. The shape and slope of the dunes are constantly changing. Most of the unvegetated dunes are moving in a southwestern direction. The ridges usually twist direction as they move. Moving sand dunes are a hazard which persons should consider prior to buying property. The dunes in The Woods have been mapped and proposed management system there will protect development from them. Elsewhere areas near the larger moving dunes are already subdivided. Development on the dunes is unwise as shifting sand makes a poor foundation for roads, and even for houses. Nags Head

has had considerable problems of this type with the road to the Villas. Development on dunes above 35 feet may be especially hazardous during storms, due to higher wind velocity and less protection from manmade and natural features. We have mapped these areas using aerial photos and transferring reductions in topographical maps prepared for the Town.

(5) Woodlands. The natural vegetative cover for most of the inner area is forest. Forests improve the macro-climate and are a major balancing effect upon the water regimen--diminishing erosion, sedimentation, flood and drought. The scenic role of woodlands is apparent, as is their provision of a habitat for game. Woodlands offer substantial potential for recreational use. The forest is a low maintenance, self-perpetuating landscape. Forests can be employed for timber production, water management, wildlife habitats, as air-sheds, recreation or for any combination of these uses. Woodlands can be constrained by zoning ordinances and the marketplace. Often woodlands, although extremely important to the ecosystem, are not adequately protected. Woodlands comprising the Nags Head Woods are protected presently by no cutting of cover requirements. The Woods have resource potential for timbering and mining of minerals (and perhaps peat). The Town feels these uses are not appropriate in light of the unique environmental value of the Woods.

(6) Poor Soils. For on-lot sewage disposal. This constraint was fully discussed in the section on "Environmental Considerations Relating to Water and Sewer." We have mapped all areas identified by the Soil Conservation Service as severely or very severely limited for the use of septic system.

(7) Recreational Areas, Historic Areas. Nags Head has a major public recreation site, namely Jockey's Ridge State Park. (Large dune area of the Woods, designated as such on the base map.) The Town has a large historic district of 30 to 60 year houses along the backfront and north of Town Hall

(8) Prime and Unique Agricultural Land. Although a portion of the Woods is presently in agricultural use, this use is not a significant use in the Town. The continuance of the use is of questionable compatibility with the integrity of the Woods. The farm was not mapped, it lies to the west of the ridge in the northern part of the Woods.

(9) Mining Areas, Other Industrial Sites, Commercial Fishing and Fisheries. These uses are not important within the Town limits. The Town recognizes the importance of these uses in neighboring area for serving residents and visitors to Nags Head. The Town currently has a cement plant, its one industrial use. Plans are for gradually phasing out this use (a non-conforming use under the zoning ordinance). Fisheries are not permitted under the zoning ordinance. The Town is cooperating in preserving these uses by taking measures to insure the quality of the Sound. (See Environmental considerations relating to Water and Sewer.)

(10) Developed Areas. Areas already developed by residential, commercial or industrial uses are not available for further development. Furthermore transportation uses eliminate roads and right of ways. Redevelopment is not likely within the planning period. Developed areas are mapped on the existing land use maps. Uses depicted on the map were labelled so as to distinguish certain sets of uses from other sets of uses, i.e. commercial (non-housing or

residential uses) from motels and residences, residential--single family and multi-family from residential and commercial housing of high densities, such as motels and cottage courts. The combination of uses is helpful in identifying conflicts caused by high densities of people and uses of automobile. Additional uses are identified on work maps so that further subsets are possible.

(11) Zoning. Zoning is a partial constraint to development. Where the density of development is historically less than that provided by the zoning ordinance as where historically the Town has developed on half acre lots and the zoning of the undeveloped land is at one acre, then you have a constraint. Single family development in Nags Head has traditionally been at 4/10 acre lots, only the SPD 40 zone is therefore a constraining zone.

#### Implication of Building Constraints

The interpretation of the environmental factors provides a basis for identifying areas where future development should occur. (See Carrying Capacity section.) Absolute constraints to development such as developed area, wetlands, stream, lakes, ponds, (especially if they are water supply), State Parks and developed areas when overlayed are dark in shade and should be completely removed from possible future development. Partial constraints, such as Woodlands, poor soils for septic systems, steep slopes (dunes), AECs (not wetlands), must be accounted for in terms of development prevented. This is a function of the degree or percentage to which development already attracted and not otherwise absolutely constrained can be accommodated. Computations are set out in the section on Carrying Capacity. Note, dunes have not

been constrained beyond the constraint provided for by the Woods constraint, to wit zoning.

The maps showing all constraints are enclosed with the text of this plan.

D. NAGS HEAD WOODS

The Nags Head Woods occupies the northwest portion of Nags Head. The Woods include the Fresh Water Pond (water supply), a large stable marshland, large vegetated (and a couple unvegetated) sand dunes, a forest with other ponds and wetlands. The Woods was the home of the first settlers. Its ecological significance has been amply documented in terms of endangered and threatened species. The Woods consists ecologically of marshland, pine hammocks, bay forest, the ridge, hardwood and pine forest(s), ponds and dunes. Each part of the system is important to the whole, although the least adverse environmental impacts would result from development in the bay and hardwood forests away from the ponds.

The existing land use in the Woods is limited to a handful of residences and one farm. The remainder is in its natural state. The principle reasons for this pattern is the lack of access by road, the costs of development, the ownership patterns, and the Town's regulations.

In the future, the Town can expect to feel increasing pressure for development. Much of the Kill Devil Hills part of the Woods is already platted for development.

The current management system relied on to protect environmentally sensitive features, the water supply and man from natural hazards is as follows. The marshes are protected by the Coastal Resources Commission through an AEC permit. Regulations are designed to prevent fill which would be necessary for residential or commercial development. Similarly AEC and zoning regulations restrict development in

the bay forest to building above flood elevation, etc. Development near the Fresh Water Pond which form the municipal water source is also limited by AEC regulation and the zoning ordinance which restrict septic systems to one per acre within 1200 feet of the edge of the Pond and eliminate their use within 500 feet of the same.

Elsewhere in the Woods, Town zoning regulations demand 40,000 square feet minimum lot sizes and prohibit development on unvegetated dunes that are part of the major dune system and which have a slope greater than 20%. They also prohibit development that would cause destruction of unique natural features.

The Woods could qualify as an area of environmental concern, as a Coastal Complex Natural Area. In the study leading to a management system for the Woods, the consultants concluded that the Woods could benefit from a management system similar to that used in the Adirondack Park. Each ecological zone has been mapped; it could be given a development density. Through allowance of transference of densities, those features more tolerant to development could be developed at greater densities, while those least tolerant left in their natural condition.

The Town supports the following policies concerning the Woods:

POLICY

1. It is the policy of the Town of Nags Head to protect from development as much as is possible the unique and natural features in the Nags Head Woods. It is also Town policy to respect the rights of those persons who own land in the Woods to have a reasonable and practical use of their property, including a reasonable rate of return.
2. The Town feels that some features in the Woods deserve more protection than others. This may be due to its unique environmental importance, its geologic importance, its historic importance, its recreational importance or a combination of these. The Town is particularly interested in protecting those feature which if not protected would result in the loss of the Woods as a unique natural area. In order of importance the Town wishes to protect: the hammocks, the ridge forest, the edges of the fresh water ponds, the ponds, the marsh, the dunes, the bay forest and scenic areas.
3. The Town hopes to accomplish this protection through Town regulations. It proposes to adopt district zones that conform to the natural boundaries of the elements of the total system that makes up the Woods and to place an appropriate development density for each zone. The Town proposes to use PUD style development to transfer density from an entire tract to that part of the tract which has been identified as most able to be developed without damaging the environment. (see map). The Town also proposes to place setbacks on ponds; restrictions of filling ponds; restrictions on building on steep slopes, in hazard areas, etc. The Town proposes to revise vegetation standards from the SPD zone and to set requirements on cover and protection of rare and endangered species.



## CHAPTER V

### TRANSPORTATION SYSTEM: HURRICANE EVACUATION AND THOROUGHFARE MOVEMENT

The Dare County beaches are very sensitive to problems arising from their transportation network. As Mayor Bryan stated at the joint meeting of Kill Devil Hills and Nags Head with Planning officials from the N.C. Department of Transportation, "They (the tourist) are our bread and butter. We must be concerned about their safety." The problems of the Town of Nags Head are two-fold--one, the capacity of the bridge systems to handle an evacuation prior to a major storm or hurricane, and two, the ability of the Bypass (and Beach road) to move traffic from the Kitty Hawk area to Whalebone Junction (where NC 12 and 64 meet) efficiently and safely.

A. HURRICANE EVACUATION

The problems associated with hurricane damage appear more critical than those of an overcapacity highway system. A successful evacuation in the face of Camille was earmarked to have saved 50,000 lives. 6,000 persons lost their lives when a hurricane hit the Texas coast in 1900.

Hurricanes are a fairly frequent occurrence on the Outer Banks of North Carolina. Orin Pilkey notes that there is an 8% probability of having a hurricane striking the Dare beaches. The Dare beaches have been spared significant hurricane activity since the 1950's, when nine hurricanes struck the coast, two of the more noteworthy being Diane and Hazel. The Dare County beaches were relatively undeveloped during the major hurricanes of the 50's. In 1954, Hazel extensively damaged one of the few developed beach resorts at that time, Wrightsville Beach, destroying 89 buildings and damaging 530 (only 20 escaped intact). Storms along the Gulf Coast suggest that winds will topple tall buildings (motels) and floods will wash away buildings that are not built above storm surge or properly fastened. In any event, during a hurricane most persons will have to abandon their cottages or homes and seek shelter on the mainland or in hurricane shelters.

In the event a hurricane were to strike the Outer Banks during tourist season, approximately 100,000 to 150,000 people would have to be evacuated through Dare County. The reason for this is that the entire population staying from Corolla in Currituck County to Oracoke in Hyde County (both on the Outer Banks) must pass through the Dare beaches to reach the mainland. The two evacuation routes are Route 64 West from Nags Head through Kill Devil Hills to mainland in Currituck County.

Before discussing the capacity of the evacuation system, let us consider the shelters that are available. The Dare County Hurricane Evacuation Plan notes that Dare County shelters are extremely limited. Of the 32 shelters available, most can accommodate only between 50 and 300 people. Many of the stations may not be usable at all because of conflicting use for housing fire and emergency vehicles. The total capacity of all shelters is probably less than 3,500 people. Some shelters are not built to flood standards, let alone hurricane. Some private sites, particularly the Villas and Dunes Condominiums may offer suitable shelters.

The evacuation system has several problems. Route 64 West, which goes through Manteo, involves three bridges (one on the intercoastal waterway) and one causeway before reaching mainland. It is two lanes and because of its many long causeway and bridge sections, would not tolerate traffic along the shoulder. Route 158 North, which goes to Elizabeth City involves two bridges, one a drawbridge on the intercoastal waterway. It is two lanes on the bridges, although there are plans to four lane north of the bridge over the Currituck Sound. The causeway from Manteo to Nags Head on Route 64 is subject to frequent flooding and has become impassable during minor storms. Much of the mainland route through Tyrrell County, which is extremely unpopulated, with only two small motels, is subject to flooding. Neither however has flooded prior to past hurricanes striking.

Pilkey suggests that a proper elevation for surviving a hurricane is about 15 feet. However, heights in excess of 30 feet or unvegetated sites may also be a problem. Flooding will occur from the sound as well

as the ocean. A major hurricane may cut inlets through the Dare beaches; especially vulnerable areas may be near the 64 causeway, through the Cove subdivision and north of Kill Devil Hills. This possibility, together with the absence of housing in suitable "hurricane proof" locations, suggest a complete evacuation is advisable.

The ideal summer evacuation could count on moving all evacuees over a 48 hour period over the two evacuation routes at maximum capacity. According to Department of Transportation estimates, the maximum capacity of the road systems is limited by the bridges to 22,000 vehicles per day per each road. This is based on the premise that both lanes of traffic would be used in a one-way direction. No allowance will be made for emergency vehicles (except those that are already east of the bridges desiring to go west). Thus it assumes no wrecks or breakdowns--no need for ambulance or wreckers. Working at full capacity, with an average population of four per car, the entire population can be easily evacuated.

There are certain problems. From observations about the evacuations in Carmen and Camille, and insights from Pilkey, we note that the Carmen evacuation was fraught by an accident which tied up traffic for 19 miles. Pilkey reminds us that people do not act normally in emergencies. He observed that "excited drivers will cause wrecks, run out of gas, have flat tires." Furthermore, conflicts will develop over use of the draw-ridges. Not only will people in cars be seeking safety, but also so will people in boats. In addition, we should expect that many people will try to salvage personal property, driving off the second car brought to the beach, towing campers and boats. Similarly,

commercial vessels and persons with large sports craft will be seeking inland harbor for their vessels. The next result will be a demand to open the drawbridges and a low occupancy in vehicles with a poor flow rate. Add to this the likelihood that only a small percentage will evacuate during the first 48 hours (after all, relaxing a week at the beach has required a substantial outlay in costs which will not be parted with easily) because they fail to realize the danger and are skeptical from lack of past experience. Finally, we must consider the possibility of one of the bridges being damaged from collision by a boat that couldn't hold a course in rough waters, and the possibility that flooding will eliminate the use of the causeway to Manteo.

We would like to look at capacity with altered assumptions.

First, let's assume:

- (1) Only 25% of the people will evacuate in the period 48 to 24 hours before the storm is forecast to arrive.
- (2) Average number persons per car will be two.
- (3) One-way systems will be used.

Then, capacity is as follows: (10,000 people)

Shelters	3,500
Residences (high ground)	1,000
48-24 hours leaving over 64 & 158	25,000
24 hours to storm over 64 & 158	88,000
<hr/>	
Total Capacity	117,500

Now if an accident occurs on one route during 48 to 24 hours, no problem. However, within the last 24 hours, capacity may be sizably reduced because the one-way system will not allow for easy removal of wrecks. Presuming one lane were eliminated for half the time period, capacity would be reduced as follows:

Wreck one-way system	- 12,000
Total capacity	105,000

If instead, Route 64 was lost to flooding during last 24 hours, capacity would be:

Flooding of causeway - Route 64 to Manteo	- 44,000
Total capacity	73,500

If capacity were diminished to accept boat traffic at drawbridges, capacity may be reduced 15 minutes on the hour or 25%.

Less: drawbridge use for boats	- 22,000
Total capacity	85,500

If capacity is reduced by wreck of drawbridge over intercoastal waterway in Currituck in last 24 hours, capacity would be

Less: one drawbridge from damage	- 44,000
Total capacity	73,500

In the event of combinations, such as flooding of causeway, and wreck on 158 North, and conflicts over use of 158 drawbridge, we find:

Wreck	- 12,000
Flooding	44,000
Conflict use	11,000
Total capacity	51,500

Or, if wreck of drawbridge north and flooding of causeway west

Flooding	- 44,000
Damage to bridges	44,000
Total capacity	29,500

It seems entirely possible to us that there will be a conflict in use between boats and autos for the drawbridge and an accident as well. We feel capacity is currently around 80,000. We should note that if a wreck occurs, a two-way system may have allowed you to evacuate more cars.

Since we had to evacuate 100,000 people, and our current capacity is 80,000 we are in excess of capacity. We can take several approaches to this problem. We can ignore the risks or select a high-risk scenario. We can seek to alter policy to effectuate an expansion of capacity: get a higher percentage evacuation on first day, build more shelters, make arrangements for use of private structures, floodproof the causeway, prevent use of drawbridges by boats during last 24 hours. The gains from these alternatives are all calculable. However, in any event, we can expect that normal growth in the next two years will render even the ideal situation at capacity. The costs of removing this constraint are the costs of a new bridge. Bridge costs are estimated at \$50 per square foot. Two additional lanes to 158 could increase ideal capacity to 162,500--an estimated population for 1985 for the Outer Banks. Two additional bridges could meet 1990 needs. The Department of Transportation has not studied the possibility of expanding the bridge systems on 64 or the bridge over the Currituck Sound on 158.

B. THE THOROUGHFARE SYSTEM

In addition to hurricane evacuation, the transportation system is called on to safely move persons through and within the Dare beach area. The current system is not capable of moving traffic; furthermore, its poor traffic flow presents a danger to the life of its users. According to Ron Poole, Department of Transportation, the bypass is currently at or beyond capacity. He stated that the average traffic counts for lag spots in Nags Head-Kill Devil Hills vicinity were as follows (1978 data expressed in average daily traffic rates). (To allow for seasonal peaks the Planning Staff suggested using a range of 2.6 to 2.9 times average daily. An ATR exists at two points for the summer months).

TABLE 1

	Daily Average	Average Summer <sup>(2.7)</sup>
Washington Baum Bridge	7,000	18,900
NC 12 Intersection	3,600	9,720
North of Oregon Inlet	2,926	7,904
*NH: 158 Bypass south of		
Town Hall	5,000	17,500
(158 Business	3,600)	9,720
KDH: 158 at Wright Memorial	8,000	21,600
(158 Business	4,000)	10,800
SS: 158	5,000	17,500

\*NH - Nags Head      KDH - Kill Devil Hills  
 SS - Southern Shores

This traffic count squares with personal observations of the residents. Traffic flows are worse on the bypass and in Kill Devil Hills near Ocean Acres. Recently, people have resorted to using the



beach road as their bypass. Traffic flows during the summer months are fortunate if they maintain a 35 mph average.

To place this information in perspective, we should note the growth in traffic since 1970.

TABLE 2

	1970 Daily Average
Washington Baum Bridge	3,200
NC 12	1,600
North of Oregon Inlet	1,700
NH: 158 Bypass south	2,650
(Business)	2,850
NH: 158 Bypass at Wright Memorial	2,950
SS: 158	2,200

Traditionally, the Department of Transportation expresses their information in terms of capacity. The capacity of the beach road and bypass varies with speed and road width. A typical rate is as follows:

TABLE 3

(Speed)	Standards on Capacity (Road Width)				
	24'	22'	20'	18'	16'
35 mph	11,000	9,450	8,460	7,700	7,150
45 mph	7,500	6,450	5,770	5,250	4,500
55 mph	3,000	2,580	2,310	2,110	1,800

The capacity of our roads are 7,500 (beach road) and 11,000 respectively.

The under capacity of this system is not only an inconvenience, it is a safety hazard. Since 1976, the Dare beaches north of the

Washington Baum Bridge have experienced 136 injury accidents with 232 total injuries. Nearly all of these injuries occur during the tourist season. One was fatal, 32 incapacitating. The data shows a consistent increase in the rate of accidents:

TABLE 4  
ACCIDENT RATES

	No. of Injury Accidents	No. Fatal	No. Incapaci- tating	Visible Injury
1976	17	0	4	10
1977	27	0	7	11
1978	39	1	9	17
1979	49	0	11	19

A larger number than usual were rear-end accidents (44.4% versus state-wide 32.7%).

The outlook for the planning period forecasts that traffic volumes will reach 35,000 to 40,000 vehicles per day on 158 Bypass by 2000.

In order to prepare for likely influx of people into the area, the Department of Transportation prepared a long range thoroughfare plan for Nags Head and Kill Devil Hills in 1973. According to that plan, DOT intended to handle the future growth (a growth much greater than they now anticipate for 2000) by building a six-lane highway with a median. In selecting this alternative, they appeared to consider several alternatives, including relocating the highway, the use of service roads and four and five lane alternatives. A new highway right-of-way was rejected because of the value of land on the beach. Service roads were rejected because of the high likelihood of accidents

from "helter-skelter" cross movement and the need for a greater road right-of-way from 150 feet. Four and five lane systems were felt to be aggravating and inadequate relief. 1979 costs for various road alternatives are estimated as follows:

TABLE 5

CONSTRUCTION COST ESTIMATES FOR TYPICAL  
THOROUGHFARE CROSS SECTIONS  
(1979 DOLLARS)

Cross Section	Cost Per Mile
A. Four lanes divided with median--Freeway	\$1,850,000
B. Four lanes divided with median--Rural	1,025,000
C. Seven lanes--Urban	1,400,000
D. Five lanes--Urban	1,050,000
E. Six lanes divided with raised median--Urban	1,680,000
F. Four lanes divided with raised median--Urban	1,075,000
G. Four lanes divided with grass median--Urban	1,100,000
H. Four lanes--Urban	740,000
I. Three lanes--Urban	600,000
J. Two lanes with parking on both sides--Urban	600,000
K. Two lanes with parking on one side--Urban	560,000
L. Two lanes--Rural	715,000
Diamond Interchange	1,400,000
Interstate Grade Separation	600,000
Bridges	\$50 per sq. ft.
Widening for Adequate Lanes and Shoulders -	
\$ 20,000 per foot per mile +	
\$350,000 per mile	
	12.79 CWL

In evaluating the capacity of a six-lane bypass, DOT estimated that such a road could handle 35,000 to 40,000 vehicles per day if it had a high standard of development. Without a high standard of development, the maximum would be 30,000 vehicles. Signalization

would decrease capacity. A "high standard of development" was described by Mr. Newman of DOT to mean control of crossovers, spacing of intersections and limits on commercial entrance and exits. Currently, many of the public streets are at intervals of 350 to 400 feet. Measures directed at controlling commercial access has met difficulties--the Attorney General's office has written an opinion to a property owner challenging the Town's restrictions of access to the bypass where access to other streets exist. According to the Attorney General, the Town cannot restrict access unless it buys the right of access from the landowner. Additional methods to increase efficiency of the bypass include: (1) requiring deep setbacks and designing parking areas with deep entrances that will allow cars easy exit from the bypass--long driveways to parking area; (2) keeping heavy traffic users from the bypass, particularly banks; (3) limiting curb cuts.

The major problems with the six lane system are the unlikelihood of its being built in the near future and its acceptance by the people as being in keeping with the family beach atmosphere. Although recently plans have been made to four and five lane 158 in Currituck County and to build a bridge over the intercoastal waterway (at a 1980 cost of \$50 million), there is reportedly a scarcity of funding for new projects. The low priority given to the Outer Banks in the past has reflected the philosophy that the area is a destination or end point and is not likely to increase industrial development in the state. DOT planners expressed concern that frustration with immediate problems might result in the development of alternatives that are incompatible with long-range plans.

If the long-range objective is to get support for a six-lane bypass, have it prioritized, funded and designed by the state within the next ten years to serve 1990 traffic flows of 25,000 vehicles/day, then another problem arises, "what do we do with the traffic flow until the six-lane road is built." DOT estimates it would take at least three years to build a six-lane road from the Currituck Bridge to NC 12. The costs of this road may exceed \$30 million.

The short or mid-range alternatives are limited, they include (1) signalization, (2) one-way pairs, (3) improvements to the Beach Road. By improving the Beach Road to a 24 foot carriageway, we could increase the capacity of this road from 7,000 to 11,000. According to DOT, the costs would include purchasing additional right-of-way. Signalization is not likely to result in better flow or capacity; however, it may reduce accidents. The costs of signals average about \$10,000/signal. Converting the Beach Road and bypass into a one-way pair would increase by 50%, so that as many as 33,000 cars could be accommodated. (Current level is 27,000, current capacity 18,000). The costs of a one-way pair system is difficult to estimate, but DOT projects sign costs at \$1,000 per intersection. Problems associated with the one-way system include potential for accidents involving pedestrians along the Beach Road and confusion to road users returning to the old town and not reading the signs. The Beach Road is currently a local collector. The road is heavily used by pedestrians going from their cottages to the ocean. A one way system would increase the speed on this road as well as the volume--conflicts between cars and walkers seem imminent. We should note that the Beach Road is experiencing increased traffic as a result of the inefficiency and poor flow on the

bypass.

Finally, immediate action needs to be taken to alleviate dangerous flow patterns near Ocean Acres subdivision in Kill Devil Hills. Strong commercial development has caused a bottleneck in this area.

A traffic flow and time frame should be identified with a short-range alternative. A time frame should be selected on the long-range alternative and decisions made for handling growth in the event the long-range project is not begun in a timely manner.

The Town has set a number of policies dealing with hurricane evacuation, the Bypass and other parts of the transportation system. Basically, the number one priority is to increase the current capacity of the Bypass to prevent loss of life from accidents there and on the Beach Road. The Town has requested that Department of Transportation prioritize the 6 lane road set out in the 1973 Thoroughfare Plan. The Town requests priority be given to increasing bridge capacity and the mainland. In the event neither policy results in actions within a reasonable time, the Town will consider growth control measures.

The Town will adopt additional regulatory measures designed to control access to the Bypass. The Town desires that the Bypass be the only through road of this type in its Town. This does not mean that other roads and streets cannot be used to go from one side of Town to another--the Beach Road can be used to move local traffic. The Town proposes a substandard road to serve local residents living along the sound. This road will not be designed to carry "through" traffic.

## CHAPTER VI

### ANALYSIS OF IMPLICATION OF DIFFERENT HOUSING MIXES

#### A. MODEL

##### INTRODUCTION

Citizens and local officials are faced with increasingly difficult decisions about how land should be used and how much and what type of development should be allowed. Often they are being presented proposals by individuals, developers, planners, and others for new types of development that they may not have dealt with before: clustered single family housing, townhouses, walk-up apartments, and high rise apartments.

In addition to assessing traditional aspects of development on the tax base, service levels, and the environment, officials must analyze the needs of a coastal community dealing with a fluctuating seasonal population, resident and non-resident demands for recreational amenities, public access to a limited, sensitive coastal environment, and non-traditional housing structure of primary and second homes and temporary shelter (such as motels, cottages, etc.). Coupled with--or more appropriately, in response to--public pressures and demand for shelter, recreation, and coastal access, is the necessity for setting forth the policies which will accomodate individuals' desires while balancing the interests of the public at

large in the local community, including development pattern, tax rates, and service levels.

### General Considerations

Determination of resultant housing patterns involves a variety of considerations by citizen policy makers and the private individual.

Generally, these include:

- (1) the supply and quality of housing and housing types;
- (2) taxation policies affecting housing types;
- (3) land development guidelines, including the existing regulatory system and the basis for new ones;
- (4) financing of housing purchases;
- (5) competition among suppliers of housing and various housing types;
- (6) the costs of municipal and governmental services (that is, the public) to the population occupying various housing types;
- (7) aesthetic considerations involving environmental, density, style, and architectural concerns.

Policy influences exerted (either potentially or actually) on such considerations involve a variety of interests at local, state, and federal levels, in addition to private sector concerns primarily of a financial nature. Relative to the myriad of considerations, local citizens and officials exert influence on a limited number of factors. However, local concerns rightfully can and must address the community development pattern and housing mix, and its resultant effect on tax base structure and the degree to which services can be effectively provided.



Projection of Effective Demand and  
Consumer Considerations

Projection of effective demand for housing normally involves analysis of four major determinants of demand: (1) household formation, (2) acquisition of second homes, (3) vacancies, and (4) net removals. Household formation involves the desire of a given population, through age attainment, changes in marital status, and other factors, to secure residential structure. Acquisition of second homes quite obviously reflects the decisions made to secure through purchase or rental a residence in addition to the household's primary dwelling.

The vacancy rate is the ratio of unoccupied units to the total housing stock, and indicates the degree of pressure of demand for housing on the available supply. Areas with more or less stable population provide relatively stable data upon which local citizens and officials can base decisions about future amounts and types of housing. Coastal communities characterized by significant seasonal population shifts can expect that plans for effecting a certain housing mix may result in higher vacancies in off-seasons and shortages during peak periods, other factors being equal. Thus it is important to consider local sentiment weighed against the factors of tax base structure and service level efficiency in order to achieve an optimal housing mix best suited to the community.

Net removals involves simply the removal of housing from total stock due primarily to age or changes in land values.

In addition to the above, other factors also affect demand for housing. These include construction costs, financing terms, interest

rates, personal income, and homeowner costs. All of these factors affect consumer decisions to secure housing, although construction, financing, and interest costs are associated as well with the supply of housing. During times when construction costs are high and financing is difficult to obtain, building construction declines. Pressures to increase the available supply results. Factors of personal income and homeowner costs deal primarily with the consumer aspects of housing. A consumer evaluates to purchase a house by considering his earning power and what the home will cost in terms of mortgage payments, property taxes, and insurance.

#### Analytical Framework

The foregoing discussion identifies some of the important considerations which need to be assessed before local communities can decide on a course of action to achieve a desired community development pattern and specifically, its housing mix. Thus far, the discussion notes some of the different types of housing; that taxation policies affect housing types and community patterns; that land development guidelines and housing policies will affect future housing types and patterns; that population occupying various housing types will entail certain services and a cost for those services; that there are aesthetic factors involving appearance and environmental concerns; and that coastal communities are subject to additional pressures involving recreation, shore access, seasonal population shifts, and sensitive environmental factors.

Ultimately, local government must decide the extent of its influence over development patterns and housing mix in consideration

of providing sufficient community services to support current and future permanent and seasonal populations, and at what cost. Coupled with this is the concern for obtaining the revenues to pay those costs, and inevitably involves the tax base.

### Model Approach

To address these issues, subsequent discussion describes the adaptation of a model to aid in assessing the relative costs of various community types comprised of different housing mixes. The model involves application of costs to each community type to enable comparisons. Data and cost factors have been developed by the Real Estate Research Corporation. Limitations of this discussion preclude the inclusion of the detailed analyses which resulted in the cost indices. Rather, the model presents a conceptual framework for discussion of the issues and aids in comparison of relative costs for different community types. Certain design factors have been incorporated into the model, and include: design for a community of 33,000 population; costs based upon 1973 constant dollars; and a net average of 3.3 persons per dwelling unit.

### Assumptions

The model described herein involves the following assumptions:

- (1) different housing mixes result in different community patterns or types;
- (2) all development produces costs to government, both initial capital costs as well as operating costs for services;
- (3) different community patterns will entail relative cost differences for provision of services, all things being equal as far as type and degree of service provision;

- (4) costs can be assessed to each community type in such a way as to enable meaningful comparisons among the various community types for provision of such services.

### Study Approach

The model is structured according to the following procedure:

- (1) identify different housing types;
- (2) consider planned versus unplanned ("sprawl") communities;
- (3) group different housing types (to obtain sample mixes) and development plan types to produce community prototypes for analysis;
- (4) consider various capital and operating costs to produce cost indices, and apply to each capital or service cost center for each prototype;
- (5) total costs for each community prototype mix, and indicate government versus private expenditures;
- (6) compare aggregate costs for each community prototype.

The section on community cost analysis which follows involves a description of the model and its components. As noted, costs applied to the model are indices and should not be construed in absolute terms. Rather, they have value in enabling comparisons of the possible, relative costs associated with different housing mixes and varying community prototypes.

Summaries are provided for much of the analysis undertaken prior to incorporation in the model. These are presented in the form of tables, and display the application of accepted cost indices developed by other researchers, primarily the Real Estate Research Corporation.

### COMMUNITY COST ANALYSIS

#### Description of Prototypes

Below are identified various housing types and the community

types which are comprised of different groupings--or mix--of housing types. Incorporated into the community types are considerations for both planned and unplanned, or sprawl, development.

### Housing Types

- (1) Single-family home, traditional lot--includes standard primary residential homes, single cottages, mobile homes, etc. on separate lot; includes seasonal and year-round use;
- (2) Single-family home, clustered--includes same types as 1 above, but grouped or clustered; in this sense, mobile home parks and cottage courts would also be included here;
- (3) Townhouses, clustered--includes groupings of townhouses which may be individually owned or involve apartment-type complexes in townhouse style which are rented;
- (4) Walk-up apartments--apartment buildings generally two or three floors; includes motor inns, motels, and so on;
- (5) High-rise apartments--apartments generally six or more floors; includes hotels and motels of similar design, condominiums, and so on.

Such housing types developed homogeneously in an area can be expected to utilize a certain amount of land. Assuming 1,000 units for each type (generally described as a "neighborhood"), Table 1 indicates the amount of land required to sustain such a housing development and its supportive facilities.

Obviously, the same number of units of low density housing will consume a much greater amount of land than will a relatively higher density of housing. Also, the lower the density of the housing type, generally the greater the number of persons occupying each unit will be, although differences in absolute values are slight.

TABLE 1: NEIGHBORHOOD LAND BUDGET

For 1,000 Housing Units

For 1,000 Housing Units		Housing Pattern (Acres)					
		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u> <sup>f/</sup>
<u>Residential</u> <sup>a/</sup>	<u>Units/ Acre</u>						
A - Single, Conventional	(3.0)	330	-	-	-	-	66
B - Single, Clustered	(5.0)	-	200	-	-	-	40
C - Townhouse, Clustered	(10.0)	-	-	100	-	-	20
D - Walk-Up Apartments	(15.0)	-	-	-	66	-	13
E - High-Rise Apartments	(30.0)	-	-	-	-	33	6
Sub- Total		330	200	100	66	33	145
<u>Open Space/ Recreation</u> <sup>b/</sup>		45	90	90	73	32	66
<u>Schools</u> <sup>c/</sup>							
Elementary		19	19	17	17	12	17
Secondary		10	10	9	9	3	9
Sub- Total		29	29	26	26	15	26
<u>Other Public Facilities</u> <sup>2/</sup>							
Churches		5	5	5	5	5	5
<u>Transportation</u> <sup>d/</sup>							
Minor, Collector and Arterial Streets		75	60	45	30	15	45
<u>Vacant (Temporary)</u> <sup>e/</sup>		16	16	34	-	-	13
Total		500	400	300	200	100	300

<sup>a/</sup> Source: Real Estate Research Corporation.<sup>b/</sup> Derived from ASPO, Standards for Outdoor Recreational Areas (ref. no. 02-001).<sup>c/</sup> Derived from Council of Educational Facility Planners, Guide for Planning Educational Facilities (ref. no. 03-021).<sup>d/</sup> Derived from Urban Land Institute, Innovations Vs. Traditions in Community Development (ref. no. 01-138).<sup>e/</sup> Derived by subtraction from rounded totals. Little significance to these quantities.<sup>f/</sup> 20% each of A-E.

### Community Types

When various combinations of housing mix are identified (including provision for planned versus unplanned development) different community types will result. For this model, six different combinations are considered, as described below. All communities are assumed to contain 10,000 dwelling units.

- I. Planned Mix Community--Consists of a housing mix of 20 percent of each housing type; thus, there are 2,000 units of each type in this community; neighborhoods are contiguous and large areas of open space are preserved.
- II. Combination Mix Community--Housing mix is the same as I, but that 50 percent of the community is constructed as planned unit developments, with contiguous and related land uses, while 50 percent is unplanned sprawl development.
- III. Sprawl Mix Community--Housing mix is the same as I and II, but development pattern occurs somewhat randomly in a leap-frog manner, with many small parcels undeveloped with vacant land remaining.
- IV. Low Density Planned Community--Housing mix is 25 percent traditional single-family and 75 percent clustered single-family; neighborhoods are contiguous, as in I, but densities are lower, resulting in less undeveloped vacant land; open spaces are preserved and land uses are comprehensively designed and interrelated.
- V. Low Density Sprawl Community--Housing mix is 75 percent traditional single-family and 25 percent single-family clustered; small parcels of passed-over land separate neighborhoods, but no land is left vacant undeveloped.
- VI. High Density Planned Community--Housing mix is 10 percent single-family clustered, 20 percent townhouse, 30 percent walk-up apartments, and 40 percent high-rise apartments, housing types are mixed in contiguous neighborhoods; much vacant land remains; considerable proportions of open space are planned, and land uses are related.

Based on the above, communities will show cost variations because of the following factors:

- (a) differences in housing mix and residential density;

- (b) differences in degree of planning, reflected in differences in land budgets;
- (c) differences in timing of development; in planned communities, housing constructed each year consists of a mix of types, while in sprawl communities, lower density housing is constructed initially and higher density housing is built later in the development period to fill in passed-over sites; also, in planned communities, other facilities are constructed earlier and are stated in larger increments, being phased according to housing construction; in sprawl communities, other facilities are built later, in smaller increments, and are not necessarily in phase with housing construction.

### Land Budgets

As discussed for each of the housing types in Table 1, land budgets for each of the community types are also indicated (Table 2). All six community types contain 6,000 acres. However, there is significant variation among communities in acreage consumed by residential uses and open space. Three categories of vacant land uses are also shown. The degree of community planning is reflected in the acreage amounts allocated to these three categories, with the passed-over land resulting in greater amounts of improved and semi-improved vacant land in the sprawl prototypes. The three vacant categories can be described as follows:

- (a) vacant, improved--contains full complement of minor and major streets and roads and all utilities; it is considered fully developed and ready for construction;
- (b) vacant, semi-improved--has arterial roads and utility mains and trunk lines running through it; there are no local streets or roads;
- (c) vacant--contains only major arterial roads; contains no utility lines whatsoever.

### Environment

All costs presented in the analysis are based on "typical" terrain and topographical conditions. The impact of more extreme site



TABLE 2: COMMUNITY LAND BUDGET

For 10,000 Housing Units		Community Development Pattern (Acres)					
		I	II Combination Mix	III	IV	V	VI
		Planned Mix	50% PUD 50% Sprawl	Sprawl Mix	Low Density Planned	Low Density Sprawl	High Density Planned
<b>DEVELOPED AREA</b>							
1. <u>Residential</u> <sup>a/</sup>	Units/Acre						
A. Single, Conventional	3.0	660	660	660	833	2,500	-
B. Single, Clustered	5.0	400	400	400	1,500	500	200
C. Townhouse, Clustered	10.0	200	200	200	-	-	200
D. Walk-Up Apartment	15.0	130	130	130	-	-	200
E. High-Rise Apartment	30.0	60	60	60	-	-	133
Subtotal		1,450	1,450	1,450	2,333	3,000	733
2. <u>Open Space/Recreation</u> <sup>b/</sup>		660	530	400	660	400	660
3. <u>Schools</u> <sup>c/</sup>							
Elementary		170	170	170	170	170	170
Secondary		90	90	90	90	90	90
Subtotal		260	260	260	260	260	260
4. <u>Other Public Facilities</u> <sup>d/</sup>		140	140	140	140	140	140
5. <u>Transportation</u> <sup>e/</sup>							
Neighborhood R. O. W.		450	450	450	640	710	300
Expressway		80	80	80	80	80	80
<b>TOTAL DEVELOPED AREA</b>		3,040	2,910	2,780	4,113	4,590	2,173
<b>VACANT AREA</b>							
1. Improved, Land <sup>f/g/</sup>		130	180	235	175	390	90
Improved, R. O. W.		22	33	43	31	69	19
Subtotal		152	213	278	206	459	109
2. Semi-Improved, Land <sup>f/g/</sup>		435	878	1,320	585	903	310
Semi-Improved, R. O. W.		21	44	70	32	48	16
Subtotal		456	922	1,390	617	951	326
3. Unimproved, Land <sup>f/g/</sup>		2,235	1,857	1,474	1,010	0	3,220
Unimproved, R. O. W.		117	98	78	54	0	172
Subtotal		2,352	1,955	1,552	1,064	0	3,392
<b>TOTAL VACANT LAND</b>		2,960	3,090	3,220	1,887	1,410	3,827
<b>TOTAL COMMUNITY ACREAGE</b>		6,000	6,000	6,000	6,000	6,000	6,000

**Notes:**

a/ Source: Real Estate Research Corporation. Extrapolated from neighborhood land budget.

b/ Derived from ASPO, Standards for Outdoor Recreational Areas (ref. no. 02-001).

c/ Derived from Council of Educational Facility Planners, Guide for Planning Educational Facilities.

d/ Assumes 10 acres + 1 acre/100 pupils for elementary and 30 acres + 1 acre/100 pupils for second. Source: Real Estate Research Corporation.

e/ Neighborhood right-of-way acreage extrapolated from neighborhood land budget. Expressway right-of-way width is 220' for a three mile length.

**f/ Vacant Areas - Total Acreage**

	I	II	III	IV	V	VI
Vacant Improved						
% of developed acreage	5%	7.5%	10%	5%	10%	5%
Vacant Semi-Improved						
% of developed acreage	15%	32.5%	50%	15%	Balance of 6,000 acres	15%
Vacant Unimproved						
% of developed acreage	Balance of 6,000 acres	Balance of 6,000 acres	Balance of 6,000 acres	Balance of 6,000 acres	None	Balance of 6,000 acres

**g/ Vacant Areas - Right-of-Way**

Percent of Vacant Improved Acreage	15%	15%	15%	15%	15%	15%
Percent of Vacant Semi-Improved Acreage	5%	5%	5%	5%	5%	5%
Percent of Vacant Unimproved Acreage	5%	5%	5%	5%	None	5%

conditions and environmental sensitivity--as might be expected in the coastal environment--can be expected to yield greater costs.

Prior to the discussion of direct cost analysis, Table 3 presents a summary of the community prototypes used in the model.

#### Direct Cost Analysis--Neighborhood Level

Direct cost analysis at the neighborhood level--that is, housing mix involving 1,000 units--involves analysis of direct capital and operating costs for the following facilities and services: residential dwelling units, open space and recreation, schools, streets and roads, and utilities (water and sewer, storm drainage, gas and electric, and telephone lines). Information on the relative costs of these items is summarized in Tables 6 and 7 at the end of this report. Below is a summary of the total costs for each housing type, the relative percentages of these costs to government and private sectors, and a breakdown of the costs to households in terms of capital costs, services charges, and taxes. Capital costs are presented first, following by operating and maintenance costs.

Housing Type	Total Capital Costs	Cost to Government/Private	Household Cap/Serv/Taxes
Single-family, conventional	\$ 48,911	15%/85%	83%/3%/14%
Single-family clustered	\$ 46,258	15%/85%	38%/43%/19%
Townhouse, clustered	\$ 27,259	20%/80%	38%/43%/19%
Walk-up apartment	\$ 21,282	25%/75%	13%/62%/25%
High-rise apartment	\$ 20,696	13%/87%	16%/71%/13%
Housing mix, 20% each	\$ 33,088	18%/82%	46%/37%/17%

TABLE 3: SUMMARY OF PROTOTYPES

	<u>Neighborhood</u>	<u>Community</u>
Population	Varies according to housing type; three populations ranging from 2,825 to 3,520 used	Population of 33,000; same for all communities
Dwelling Units	1,000 for each neighborhood	10,000 for each community
Acreage	Varies from 100 to 500 acres, depending on assumed densities and housing types	6,000 acres for each community
Development Pattern	Conventional and clustered	Planned, sprawl, and combination
Housing Types	(A) Single-family, conventional (B) Single-family, clustered (C) Townhouses, clustered (D) Walk-up apartments (E) High-rise apartments (F) 20% mix of each type (A)-(E)	(I) 20% mix; planned (II) 20% mix; combination (III) 20% mix; sprawl (IV) 75% single-family conventional; planned (V) 75% single-family conventional, 25% single-family clustered; sprawl (VI) 10% single-family clustered, 20% townhouses, 30% walk-ups, 40% high-rise apartments; planned
Environments	"Undistinguished" site with typical environmental features; not site specific	Same as neighborhood
Commercial	Convenience center, 7,500 square feet of building area, 21,780 square feet of land area.	(a) Strip commercial development, 200,000 square feet of building area, 1,056,000 square feet of land area (b) Center commercial development, 240,000 square feet of building area, 740,000 square feet of land area.

Housing Type	Total Operating Costs	Cost to Government/Private	Households Service/Taxes
Single-family, conventional	\$ 1,721	67%/33%	35%/65%
Single-family clustered	\$ 1,720	67%/33%	36%/64%
Townhouse, clustered	\$ 1,388	72%/28%	33%/67%
Walk-up apartment	\$ 1,319	74%/26%	30%/70%
High-rise apartment	\$ 548	57%/43%	52%/48%
Housing mix, 20% each	\$ 1,410	71%/29%	34%/66%

Clearly, at the neighborhood level, the lower the density of housing type, the greater the capital costs and operating and maintenance costs. Relative proportions of costs to government and private sectors also indicate that, generally, there is a lower proportion of costs to government the higher the density of housing type.

#### Direct Cost Analysis--Community Level

The community cost analysis includes both capital and operating costs for all facilities and services examined at the neighborhood level. At the community level, additional items analyzed include: police and fire services, government regulation, solid waste collection and disposal, postal service, health care, libraries, and churches.

No economies or diseconomies of scale are assumed in the capital or operating costs estimated. However, facilities which would be inappropriate at the scale of 33,000 population (for example, an electric power plant) are not included in cost estimates. Standards and unit costs reflect national norms or averages taken from a number

of studies. All costs are expressed in 1973 dollars, and financing costs for capital expenditures are not included. Present technologies, construction practices, and service standards are assumed.

Tables 4 and 5 summarize information on the relative costs of the items addressed (as noted above) for each of six community development prototypes. Below is a summary of the total costs for each community type, the relative costs to government and private sectors, and a breakdown of the costs to households in terms of capital costs, service charges, and taxes. Costs are indicated only for the tenth year, assuming a ten year period is required to facilitate the development of 10,000 units with services capable of supporting an ultimate population of 33,000. Capital costs are presented first, followed by operating and maintenance costs.

Community Prototype	Total Capital Costs	Cost to Government/Private	Households Cap/Serv/Taxes
Planned mix	\$ 357,533	16%/84%	47%/38%/15%
Combination mix com.	\$ 368,162	21%/79%	43%/37%/20%
Sprawl mix community	\$ 372,833	24%/76%	41%/37%/22%
Low density planned	\$ 489,806	12%/88%	81%/7%/12%
Low density sprawl	\$ 514,559	19%/81%	75%/6%/19%
High density planned	\$ 287,062	18%/82%	26%/56%/18%

TABLE 4

COMMUNITY COST ANALYSIS  
CAPITAL COSTS

COST CATEGORY	Community Development Pattern					
	Planned Mix	Combination		Sprawl		High Density Planned
		50% PUD	50% Sprawl	Mix	Low Density Planned	
	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>
<u>Open Space</u>	\$ 2,968	\$ 2,826	\$ 2,684	\$ 2,968	\$ 2,684	\$ 2,968
<u>Schools</u>	\$ 45,302	\$ 45,382	\$ 45,307	\$ 45,382	\$ 45,382	\$ 45,382
<u>Public Facilities</u>	\$ 16,216	\$ 16,441	\$ 16,453	\$ 16,259	\$ 16,615	\$ 16,304
<u>Transportation</u>	\$ 27,077	\$ 29,768	\$ 32,353	\$ 33,770	\$ 37,965	\$ 22,862
<u>Utilities</u>	\$ 33,227	\$ 36,042	\$ 38,684	\$ 47,444	\$ 61,974	\$ 22,432
Subtotal	\$124,870	\$130,459	\$135,556	\$145,823	\$164,620	\$109,948
<u>Residential</u>	\$214,172	\$214,172	\$214,172	\$318,291	\$320,400	\$160,300
(Exclusive of Land)	\$339,042	\$344,631	\$349,728	\$464,114	\$485,020	\$270,248
<u>Land</u>	\$ 18,491	\$ 23,531	\$ 23,105	\$ 25,692	\$ 29,539	\$ 16,814
Total Capital Cost	\$357,533	\$368,162	\$372,833	\$489,806	\$514,559	\$287,062

Source: Real Estate Research Corporation

TABLE 5

COMMUNITY COST ANALYSIS  
OPERATING AND MAINTENANCE COSTS

COST CATEGORY	Community Development Pattern						
	Planned Mix	Combination 50% PUD 50% Sprawl	Sprawl Mix	Low Density Planned	Low Density Sprawl	High Density Planned	
	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	
<u>Open Space</u>	\$ 380	\$ 320	\$ 260	\$ 380	\$ 260	\$ 380	
<u>Schools</u>	\$ 9,643	\$ 9,652	\$ 9,737	\$ 9,643	\$ 9,737	\$ 9,643	
<u>Public Services</u>	\$ 5,103	\$ 5,296	\$ 5,405	\$ 5,165	\$ 5,575	\$ 5,164	
<u>Transportation</u>	\$ 260	\$ 260	\$ 261	\$ 354	\$ 396	\$ 209	
<u>Utilities</u>	\$ 3,987	\$ 3,988	\$ 3,989	\$ 5,130	\$ 5,141	\$ 3,335	
<u>Total Ten Year Operating Costs</u>	\$ 19,373	\$ 19,516	\$ 19,652	\$ 20,672	\$ 21,109	\$ 18,731	
<u>Cumulative Costs</u>	\$ 125,265	\$ 117,299	\$ 109,489	\$ 133,186	\$ 116,827	\$ 120,919	

Source: Real Estate Research Corporation

TABLE 6

NEIGHBORHOOD COST ANALYSIS  
CAPITAL COSTS

COST CATEGORY	Housing Pattern					
	<u>Single-Family Conventional</u>	<u>Single-Family Clustered</u>	<u>Townhouse Clustered</u>	<u>Walk-up Apartment</u>	<u>High-Rise Apartment</u>	<u>Housing Mix</u>
	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>
<u>Open Space</u>	\$ 220	\$ 274	\$ 274	\$ 252	\$ 203	\$ 245
<u>Schools</u>	\$ 5,354	\$ 5,354	\$ 4,538	\$ 4,538	\$ 1,646	\$ 4,538
<u>Transportation</u>	\$ 3,080	2,661	\$ 2,111	\$ 1,464	\$ 801	\$ 2,064
<u>Utilities</u>	\$ 5,483	\$ 3,649	\$ 2,369	\$ 1,579	\$ 958	\$ 2,782
<u>Subtotal</u>	\$14,137	\$11,938	\$ 9,292	\$ 7,833	\$ 3,628	\$ 9,629
<u>Residential</u>	\$32,146	\$31,724	\$16,263	\$11,766	\$15,188	\$21,417
(Exclusive of Land)	\$46,283	\$43,662	\$25,555	\$19,599	\$18,796	\$31,046
<u>Land</u>	\$ 2,628	\$ 2,596	\$ 1,704	\$ 1,683	\$ 1,900	\$ 2,042
<u>Total Capital Cost</u>	\$48,911	\$46,258	\$27,259	\$21,282	\$20,696	\$33,088

Source: Real Estate Research Corporation



TABLE 7

NEIGHBORHOOD COST ANALYSIS  
OPERATING AND MAINTENANCE COSTS

	<u>Housing Pattern</u>					
	<u>Single-Family Conventional</u>	<u>Single-Family Clustered</u>	<u>Townhouse Clustered</u>	<u>Walk-Up Apartment</u>	<u>High-Rise Apartment</u>	<u>Housing Mix</u>
	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>
<u>Open Space</u>	\$ 30	\$ 41	\$ 41	\$ 41	\$ 30	\$ 37
<u>Schools</u>	\$1,168	\$1,168	\$ 989	\$ 989	\$ 270	\$ 989
<u>Transportation</u>	\$ 37	\$ 28	\$ 18	\$ 11	\$ 6	\$ 19
<u>Utilities</u>	\$ 484	\$ 483	\$ 340	\$ 278	\$ 243	\$ 365
<u>Total Operating Cost</u>	<u>\$1,721</u>	<u>\$1,720</u>	<u>\$1,388</u>	<u>\$1,319</u>	<u>\$ 548</u>	<u>\$1,410</u>

Source: Real Estate Research Corporation

Community Prototype	Total Operating Costs	Cost to Government/Private	Households Service Taxes
Planned mix community	\$ 19,373	55%/45%	49%/51%
Combination mix com.	\$ 19,516	60%/40%	44%/56%
Sprawl mix community	\$ 19,652	61%/39%	43%/57%
Low density planned	\$ 20,672	51%/49%	52%/48%
Low density sprawl	\$ 21,109	57%/43%	46%/54%
High density planned	\$ 18,731	55%/45%	48%/52%

Again, the summaries clearly indicate that, at the community level, low density combined with unplanned development produces the highest costs. The higher the density, the less the cost.

#### CONCLUSION

The summary analyses presented here speak for themselves and indicate that planned, higher density communities will result in lower overall capital and operating costs, and that government's share in those costs is much less.

#### Tax Base

The data presented as a result of the application of a model to analyze costs indicates that it is less expensive to service higher density housing types. It is a fair assumption that such developments likely would produce the greatest amount of tax revenues as well. Thus, there is a double benefit to the local community concerned with its future development and housing mix, should it consider higher densities.

Environmental Concerns

With the exception of land consumption, the model does not consider (as presented here) any environmental consequences of development beyond "normal" site situations. Such factors need to be explicitly identified and analyzed in terms of site specific information. However, all things being equal (and they usually are not when concerned with the environment), the more land utilized in development, the greater the possibility of environmental disruption with associated greater costs.

COMMENTS ON APPLICATION OF MODEL

Nags Head's development has exceeded that of the neighborhood and is moving towards a community (according to model). In the shift, it will move from a neighborhood housing type 1F), actually a variety of it, to a community type IV. Because of the model development, it is hard to categorize the Town in the neighborhood model, although the above appear reasonable--the reader may select a different scenario, after analyzing the housing information presented in the population paper. The costs to government in the mix that is predominantly motel (high-rise) and single family conventional or clustered range from 13 to 15% the capital costs of the units, \$48,911 and \$20,696 respectively. Operating costs for government ranged from 57 to 67%. Highest cost to government at the neighborhood level of development were incurred with moderate densities, both in capital and operating costs to government.

During the next ten years Nags Head will probably develop in such a way that it will resemble a low density planned community, although with much less cluster. Both scenarios should result in a lower percentage of capital costs and operating costs than would other scenarios.

Anticipated costs for various services such as schools, roads, utilities, etc. are set out in the tables.

C. SOME ADDITIONAL APPLICATION TO NAGS HEAD:  
REVENUE/COSTS

Although the model we have selected and modified above was chosen because of its adaptability to the Dare County beaches, there were obvious differences in the revenue costs which make this section dealing with application necessary. This section attempts to draw some preliminary conclusions about revenue and costs under (3) different scenarios, one the trend of the 1970s, the others housing mixes under moderate and high densities. All costs are in 1980 dollars. Information concerning estimated tax values for different housing types was based on values supplied by the Dare County tax office, with adjustments made after spot-checking a number of individual properties in the town.

CURRENT NAGS HEAD POPULATION

Housing Type	Pop. '80	Units	Added Pop. '90	New Units
Mobile Homes	107	38	0	0
Single Family	6493	1355	14883	3447
Townhouse	527	117	1860	580
Cottage Court	2976	850	930	290
Motel	3504	1001	930	290

(TREND)

HOUSING MIX AND INCREMENTAL REVENUE  
FROM NEW UNITS TO 1990

Housing Type	% of Total Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	0%	0	\$14,000	\$ 000	0
Single family	80	3447	22,000	75,834,000	862
Townhouse	10	580	19,000	11,020,000	58
Cottage Court	5	290	8,000	2,320,000	29
Motel	5	290	8,500	2,465,000	6

HOUSING MIX AND INCREMENTAL REVENUE FROM NEW  
UNITS TO 1990 UNDER ASSUMPTION OF A HOUS-  
ING MIX WITH MODERATE DENSITY

Housing Type	% of Total Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	0%	0	\$ 14,000	\$ 000	0
Single family	50	2067	22,000	45,474,000	517
Townhouse	25	1033	19,000	19,627,000	103
Cottage Court	5	265	8,000	2,120,000	26
Motel	20	1063	8,500	9,035,500	21

HOUSING MIX AND INCREMENTAL REVENUE FROM NEW  
UNITS TO 1990 UNDER ASSUMPTION OF A HOUS-  
ING MIX WITH HIGH DENSITY

Housing Type	% of Total Stock	# of Units	Valuation Per Unit	Total Valuation	Acres Used
Mobile Homes	0%	0	14,000	\$ 0000	0
Single family	35	1447	22,000	31,834,000	362
Townhouse	35	1447	19,000	27,493,000	145
Cottage court	0	0	8,000	000	0
Motel	30	1595	8,500	13,557,500	32

If we contrast the revenue aspects from future development in terms of total valuation and as a function of acreage, we note the following. (Note, total valuation must be adjusted to account for the removal of vacant lots from the tax base. An average for vacant lots was set at \$10,000. (\$40,000 per acre subdivided.) Tax revenues are expressed as the incremental amount raised from new housing between 1980 and 1990 based on a tax rate of \$.52/\$100.

REVENUE GENERATION FROM NEW HOUSING WITH  
DIFFERENT MIXES

	1970s Trend	Moderate	High Density
Total Valuation	\$91,639,000	\$76,256,000	\$72,884,500
Less: Vacant Lots	\$38,200,000	\$28,800,000	\$21,560,000
Net Valuation	\$53,439,000	\$47,456,500	\$51,324,500
Revenue Produced	\$ 277,882	\$ 246,774	\$ 266,887
Acres Developed	\$ 955	\$ 667	\$ 539
Revenue/Acre	\$ 290.97	\$ 369.97	\$ 495.15

From the above, we notice that the revenue produced during the planning period from low density development should in fact be higher than under either moderate or high density development. However, since the higher densities require less land to be used for development, land that is undeveloped (vacant land) can still be developed in the future, with additional revenues being generated from this land. Thus, if we do not change any of the land unused under different scenarios into open space, we would expect that high density development will generate the most revenue (this is best expressed as a function of acreage.) One of the benefits of higher

densities in development is the potential for acquisition of open space without loss in revenues when compared with lower density developments. We should note that since government would be presumed to never operate at a loss (i.e. they would raise the tax base to prevent this from happening), that the proper test to measure advantages from differing housing types would be incremental net benefits. This implies some appreciation for differing costs under various densities.

Unlike the revenue side of the coin, the cost side is more difficult to express. During the next ten years, Nags Head will need to either persuade future developers to build their own systems or provide a public sewer system. A rough calculation placed the yearly costs for such a system (local collector portion only) at \$267,000. The demand for such a system will depend on the amount of development which occurs on soils unsuitable for septic systems, see map enclosed, and whether the total constraints, see constraint analysis and population projections, are exceeded. It is feasible that Nags Head can accommodate its future population to 1990 on suitable soils. The costs of public sewers and alternatives are set out in detail in the section dealing with environmental considerations.

The implications of future population to the public water system are more predictable. The current above ground storage capacity and the main line sizes are not adequate for the immediate future. The costs of improvements to this system were estimated at \$11.41 per user (with 1500 users).

In planning a growth pattern, it is obvious from the model that planned high density or low density cluster offer substantial savings.



These savings result because of a decrease in the amount of pipe that must be laid and the number of pumping stations needed (sewer only).

Solid Waste. The costs of solid waste removal are particularly sensitive to the density. Higher densities of development reduce the number of stops or pickups and the amount of time spent in collection.

Roads. The higher the density of development the less the area to be served. This translates into less miles of road required to be paved and maintained. These costs may be sizeable.

Fire and Police. Fire and police are extremely sensitive to the number of people served and the distance traveled to respond to calls. Some savings should be possible from the concentration of population, however, this should not be as significant as previously mentioned services.

Schools. The costs of operating the school system is borne by the county. However, in calculating this and social service costs, the nature of the population is important since it places a small burden on the local tax base compared to a similar year-round population for the same number of units.

Environmental and other costs. The costs of development emphasizing single family development on one-fourth acre lots are significantly greater than the costs from higher density styles of development. As was noticed from the revenue charts the higher the density the more vacant land left in the community. Through purchase and the police power, some of this land may be left as open space. Where the open

space protects lands that are unsuitable for development from an environmental perspective, as when it decreases the density of development on poor soils adjacent to the sound, substantial detriment to the quality of the sound may be avoided. Similarly open space can protect vegetated areas and hazard areas.

The residents of Nags Head have expressed a desire to protect the family beach atmosphere in the town. We suspect that this image depends considerably more on the amount of open space in the town than they realize.

#### Some Comments on the Tax Structure; Conclusions

One of the most often underrated land use tools is the taxing policy of the government. In many instances the taxing power implicitly shapes the choices of housing stock and areas likely to be developed.

We noticed the following:

- (1) from the vantage point of net revenue, motels do not generate as much revenue per person accommodated as do single family houses;
- (2) underdeveloped lots are disproportionately taxed, thereby encouraging development. We noticed that vacant lots were 85% of market value whereas the buildings on the lots were often only 30% of market value;
- (3) townhouses appear to be a good deal when trying to balance concerns over revenue to government (both net and per acre), costs to the citizen to build, and impact on the environment;
- (4) because revenue production to the state and federal government is more sensitive to income taxes and sales taxes, as opposed to ad valorem taxes, one would expect that policies in this sector will focus on savings from decreased costs.

## CHAPTER VII

### RECREATIONAL ASPECTS

Because many of the permanent residents and non-resident property owners major connection with the Town of Nags Head arises from either the use of the beach or the sound for swimming, fishing, walking or boating, it is imperative that recreational policies be a fundamental part of the land use plan. An analysis of recreational opportunities must include an appraisal of present and future demand, an assessment of future facilities and possibilities for the provision of future facilities and an anticipation of alterations in people's moods, habits or demands.

#### Existing and Future Demand

Two factors play a major role in the demands on the Town as a recreational facility. First, we have the natural growth rate of the municipality and adjoining municipalities. Second, we have the increased importance which camping and outdoor recreation is realizing as it relates to the region surrounding Nags Head. Against these two factors we have the more limiting roles played by the economic condition and the availability of energy.

Neither the growth rate in Nags Head, nor the number of day visitors passing through or stopping in Nags Head appears to be affected to any great degree by the availability of fuel. Both in 1973 and in

the summer of 1979, the county experienced major problems with the availability of gasoline for automobile use, yet the number of new visitors both in Nags Head and neighboring beaches increased slowed only by a factor which seems to allow for tight money and a shortage of it.

Nags Head appears to be very sensitive to the availability of mortgage money at a reasonable rate. In 1974 through 1975, when mortgage rates climbed following inflation stimulated by high energy prices and second home mortgage money became difficult to obtain from lending institutions. Nags Head and its neighbours experienced a decline in the rate of growth as seen in the number of new housing starts. Since we are currently in a period of high interest rates, we can expect that the immediate forecast concerning demand may have to be tempered. However, we should note that the Town experienced an average 8% per year growth rate despite the poor years of 1973-74.

In terms of recreational demand from a regional perspective the North Carolina Statewide Comprehensive Outdoor Recreation Plan forecasts strong increases in demand for nearly all types of recreational opportunities, but especially for water related ones.

Looking at the reverse side of the coin, those persons who inhabit the Town during the peak season and during the entire year have differing expectations concerning the opportunities that the Town should provide by way of recreation. Both the permanent residents and the non-resident real property owners stress the major importance of beach related activities. In their response to the questionnaire mailed with this land use plan update, they indicated

a strong desire to see the setting side of public access points together with the building of parking facilities for servicing these areas. although no other recreational facility received enough support to demand its being considered (as a result of the questionnaire) for public funding, several other facilities received a considerable amount of attention, namely jogging and walking paths, sound access areas and perhaps boat ramps and moorings. Conventional recreational facilities for inland communities ranked very low in demand here.

### Existing Facilities

Beach access: Beach access is provided by both the private and public sectors. Motels and cottage courts account for several miles of beach front along the Atlantic Ocean. Since the motels are open to the public and have a high turnover, they offer the opportunity of the right to use the beach to many persons who would be deprived of this opportunity were the beach developed solely in low density housing. In addition to private access, the Town has designated a number of beach access points where street right-of-way dead-end into the beach. The Nags Head Beach Access Plan states:

that there are some 33 access points within the corporate limits. . . . Of [these], 11 are paved, 16 have clay surfaces and 6 are unimproved. Generally speaking, they average about 200 feet in length . . . [by] 50 feet wide.

The Access Plan notes that although most rights-of-way have been improved, this was done to provide access to adjoining property owners and are not suitable for parking. Other parking areas are able to handle only a few parked cars. Most of the access points are experiencing heavy pedestrian traffic and are used principally by persons inhabiting summer cottages/houses) that are west of the beach road. As the areas west of the Bypass develop, one can

expect increasing pressures on the Town to purchase parking areas to service these residents. Day users and passers-by also contribute to an unmet demand.

Sound access: Only two streets provide public access to the sound. There are no public boatramps, moorings or docking facilities. Commercial boat access exists on the causeway for a handful of boats. Most of the sound immediately adjacent to the Town is too shallow for sailboats. Boat access for cottage residents is provided by canal from the Cove subdivision. In addition, residents of the townhouse development, the Villas, have sound access for boating.

Unique and unusual: Jockey's Ridge is a unique, high natural soundside dune which attracts visitors. It is a registered National Historic Landmark owned by the State. It offers one of the few hang-gliding sites in North Carolina. Other soundside dunes are attractive climbing terrain to residents and passer-bys. Some of the local roads crossing the high dune areas offer scenic vistas of the ocean and sound.

Nature walking: The Nags Head Woods (partially in public ownership) offers the opportunity to partake in nature walks. The Nags Head Woods contains rare and endangered forests, live-oak forests, marshlands and fresh water ponds.

Fishing: In addition to boat fishing in the sound, Nags Head offers opportunity for surf fishing and pier fishing. Three commercial fishing piers are located on the ocean.

Other: In addition to the above uses, Nags Head residents use the ocean for surfing, the beaches during non-summer months for off-road vehicles, and the soundside for duckhunting.

But perhaps the favorite use of all is beachwalking and beach-combing! swimming and sunbathing!

Conventional facilities: Nags Head does not have any public facilities for tennis, golf, indoor or outdoor ball games. However, there does not appear to be any real demand for any of these uses.

#### Policies of the State of North Carolina

The Department of Natural Resources and Community Development has developed "Shoreline Access Policies" for the coastal area. The essence of the policies appear to be that localities in the coastal zone must provide adequate access and parking for the general public (not just the residents, local, permanent or seasonal).

#### Standards

Standards dealing with outdoor recreation in a beach community seem highly subjective. Ron D. Johnson, one of the principal contributors to Ocean And Estuarine Recreation Access in Carteret County, estimated that approximately 20% of the total population at the beach would attempt to use the beach at one time. Therefore, beach access areas must be able to handle that percentage of the population which is not capable of walking to the beach. In 1979 the Town of Nags Head determined that it would be desirable for the community to provide fully improved access points at 1500 foot intervals along the beach.

Policies and Actions by the Town of Nags Head

Currently the Town is continuing its program of improving street rights-of-way deadending into the beach in an effort to ensure beach access. Beach access and parking are included in the capital facility plan for the Town.

Problems

The Nags Head Questionnaire brought forward several attitudes towards recreational facilities. Outside of a willingness to spend public monies for beach access and parking, there is not a strong need for recreational facilities. There is some support for the idea that additional recreational opportunities deserve consideration, specifically sound access, walking and jogging paths. The foremost project appears to be the continuation of actions towards making public numerous (as yet unaccepted because not maintained) street right-of-ways leading to the ocean.



## CHAPTER VIII

### CULTURAL RESOURCES

Nags Head has a lengthy oceanfront area of old cottages built after access became available from the mainland. This area extending 9/10 of a mile and lying north of the Town Hall includes some 60 houses. Most of the houses are still in the original ownership. The houses are of an easily identifiable architectural style with wood siding, two stories on the main frame and quarters extending like an "L" to the Beach Road. The houses were added to the National Register as Nags Head Beach Cottage Row District in 1977. The implication of such a classification is that of tax penalties and incentives. According to the Tax Reform Act property on the National Register when used for commercial purposes (as for rental) is eligible for special treatment, namely accelerated depreciation of all real estate improvements connected with restoration above the base cost of the house in 5 years. Furthermore, if a landowner decided to destroy property on the Register, the costs of destruction are not deductible as a cost of business and the new or replacement structure is limited in methods of appreciation available as it is straight line.

In addition to the cottages, the State is currently studying the Ferring House and the First Colony House for inclusion in the National Register.

Historic and architecturally significant buildings can be adversely affected, both directly and indirectly, by a large number of activities. All construction projects have the potential to require the demolition of important, though simple, structures on a site as well as to alter the use of nearby land thereby causing secondary impacts to a building of historic or architectural importance. In addition, new construction is frequently unnecessary as existing buildings can be renovated for adaptive reuses; often these are uses quite different from the use intended at the time of a building's construction. Rehabilitation is more energy conservative and job intensive than new construction, and recycles elements of the coastal historic character into everyday use.

Archaeological resources are fragile and nonrenewable. Such resources include both historic and prehistoric sites on land. These sites are found in urban and rural areas, as well as along the shores. Archaeological sites contain vast amounts of information about our past; information that, at times, can be found nowhere else.

Due to the fragile nature of these resources, many different types of activities damage or destroy archaeological sites. Most activities that involve ground disturbance, such as construction, grading, excavation, and even agricultural and timbering activities damage or destroy these resources. Other types of activities that do not necessarily involve ground disturbance can also affect archaeological sites. These activities include recreational use, flooding, erosion and soil compaction.

Underwater cultural resources often hold a wealth of information due to excellent artifact preservation and their normally undisturbed

condition. Exploration and study of historic waterfronts, abandoned or wrecked vessels, etc., can shed light on many aspects of maritime history associated with this planning area which might otherwise be unknown. Therefore, the understanding and proper management of these irreplaceable cultural resources is extremely important to prevent their loss during future development.

Disturbance of submerged bottom lands, particularly during new dredging, jetty construction, and beach replenishment, should consider possible effects to underwater cultural resources during the earliest stages of planning. Areas where known shipwrecks exist, many of which are plotted on USGS maps or Geodetic Survey charts, and areas known historically to have seen extensive maritime activities (such as inlets, shipping lanes, and hazard areas) should be avoided if possible. If not, documentary investigation and, where warranted, underwater archaeological survey should be initiated to determine the existence of cultural resources and to assess their significance.

A list of federal and state laws and regulations protecting cultural resources is attached.

## FEDERAL, STATE AND LOCAL CONTROLS

FEDERAL

- \_\_\_\_\_ National Historic Preservation Act of 1966
- \_\_\_\_\_ The Archeological and Historic Preservation Act of 1974, Public Law 93-291
- \_\_\_\_\_ Executive Order 11593, Protection and Enhancement of the Cultural Environment, 16 U.S.C. 470 (Suppl. 1, 1971)
- \_\_\_\_\_ National Environmental Policy Act, Public Law 91-190, 42 U.S.C. 4321 Et. Seq. (1970)
- \_\_\_\_\_ Community Development Act of 1974, Public Law 93-383: Environmental Review Procedures for the Community Development Block Grant Program (40 CFR Part 58)
- \_\_\_\_\_ Procedures for the Protection of Historic and Cultural Properties (36 CFR Part 800)
- \_\_\_\_\_ Comprehensive Planning Assistance Program (701) as Amended by Public Law 93-393
- \_\_\_\_\_ The Department of Transportation Act of 1966, Public Law 89-670
- \_\_\_\_\_ Identification and Administration of Cultural Resources: Procedures of Individual Federal Agencies

STATE

- \_\_\_\_\_ G.S. 121-12(a) Protection of Properties in the National Register
- \_\_\_\_\_ State Environmental Policy Act, Article 1 of Chapter 113A of the General Statutes
- \_\_\_\_\_ Executive Order XVI
- \_\_\_\_\_ Indian Antiquities, G.S. 71.1-4
- \_\_\_\_\_ Salvage of Abandoned Shipwrecks and Other Underwater Archeological Sites: G.S. 121-22, 23; 143B-62(1) g, (3)
- \_\_\_\_\_ Archeological Salvage in Highway Construction, G.S. 136-42.1
- \_\_\_\_\_ Provisions for Cultural Resources in Dredging and Filling Operations, G.S. 113-229

## CHAPTER IX

### CARRYING CAPACITY: METHODOLOGY AND APPLICATION

In order to develop a set of policies to guide future growth, a municipality must seek to balance the demand for development with the land capable of being developed. The land capable of being developed is the carrying capacity. The carrying capacity of the land reflects many private and governmental policies, decisions and attitudes. Thus, if a municipality has a policy of evacuating persons from its limits during a major storm, the number of persons who can be accommodated during a reasonable period prior to the storm on its highways and bridges would represent its carrying capacity. Similarly the carrying capacity of the water system reflects its service ability without incurring a diminution in water pressure or water quality. To a certain degree this standard (as are many others) is personal, to some degree it represents non-local standards as in State standards for quality of municipal water supply, and to some degree it represents local municipal standards. Where public sewers exist the capacity of the system is the capacity of the waste treatment facility (if it is exceeded the State will probably prohibit further connections), where public sewers do not exist the capacity of the land to handle on-lot sewage disposal system will represent this constraint. The ability of the land to handle on-lot sewage disposal

reflects government policies towards pollution of the sound and risks of health hazards.

The carrying capacity of a municipality is the limit of its most constraining system (be that hurricane evacuation, transportation, water or sewer facilities, on-lot sewage disposal, health care, etc.) As we suggested above, the carrying capacity must be matched with the land demanded for development and the people desirous of being served at a particular date. Where the amount of land suitable for development is less than that demanded, the municipality is considered constrained. A municipality must seek to become unconstrained. This can be accomplished by altering the demand side or the capacity side of the equation. To alter the demand side, one can alter the attractiveness of the land consumed in development. This would involve slowing the growth rate or creating a higher density housing mix. To alter the capacity side, the municipality can create additional facilities or alter a policy which restricts development.

#### Calculating Demand

To calculate demand we need to know the number of persons in the Town in 1980, the growth likely to occur to 1990, the land consumed by the 1980 population and the land like to be consumed by the 1990 population. In addition to these residential uses (motel, cottage court, townhouse, single family houses), we need to know the amount of land used in 1980 for commercial, institutional and recreational uses. Where a deficiency exists in any of these uses at the present time, we must consider adjustments to this use which will make it more in accord with our experience from dealing with similarly

situated municipalities.

To project the amount of land that would be needed to meet the 1990 population, we multiplied the additional population anticipated to move into the area by 1990 times the standard for land needed in that classification. Several non-residential classifications were presumed to adjust to more typical ranges within the next ten years. The equation for determining land use requirements is as follows:

$$L_{90} = L_{80} + P_{80-90} [K_h + K_r + K_c + K_i + K_t]$$

(Note: we modified this expression to handle the expression of land requirement for transportation)

Where:

$L_{90}$  = Land required for urban uses in 1990

$L_{80}$  = Land required for urban uses in 1980; therefore  
 $L_{80-90}$  is land required for urban uses from  
 additions to the population during these years

$P_{80-90}$  = Population added to municipality between 1980 and 1990

$K_h$  = Standard land requirement for residential use

$K_r$  = Standard land requirement for recreational use

$K_c$  = Standard land requirement for commercial use

$K_i$  = Standard land requirement for institutional use

$K_t$  = Standard land requirement for transportation use

#### Calculating the Constraints

In order to express the constraints in a way that would relate to the use of the land, we either calculated the capacity directly or mapped the land constrained and then added up the acreage to compute the capacity. The following are some of the constraints we considered:

Sewer: We made no provision for a sewer system being built within the ten year period. If one were built, we calculate that the load would be far in excess of capacity at the time it is completed. See capacity from paper on Environmental Considerations.

Hurricane: We feel that the Town is currently at or beyond its share of the population that would need to use the bridges to leave the barrier island during a 48 hour period preceding a major storm or hurricane. (See Transportation Paper)

Water System: We have presumed that additions will be made to the water system to allow it to serve any level of population anticipated within the planning period.

Wetlands: We constrained only those wetlands that were regulated as areas of environmental concern by the State. Other wetland areas will be measured in land unsuitable for septic systems. Wetlands serve many functions: they act as recharge groundwater reservoirs, as a waste treatment plant by settling out sediment and nutrients, as plant and wildlife habitats. Wetlands are suitable for non-intensive recreational and educational purposes (e.g. hiking and nature trails, fishing, hunting).

Flood Hazard Areas: Although in many inland communities flood hazard areas are considered a constraint to development, they are not considered one here. The reason for lifting the constraint is that if one builds above the flood level by the use of pilings sunk into bedrock and utilizes construction methods designed to prevent flood and related hazard damages, then damage should not occur. The town of Nags Head complies with State Building Code designed to prevent damage from wind and flooding.



State and Federally Owned and Managed Land: Areas owned by governmental agencies for recreational and other purposes are not considered within the scope of developable lands. We removed Jockey's Ridge from our calculations.

Soils Unsuitable for Development: Areas which do not permit proper functioning of septic system filter beds because of wetness, flooding, steepness, overly slow or rapid permeability are not suitable for development without municipal sewage treatment. By not being suitable we mean that a municipality will probably have to accept certain consequences for using such lands for residential use, namely pollution of the water in the Sound and possibly the groundwater. The County Health Department could be expected to prevent operation of septic systems that are a human health hazard at the site.

Dunes: Development on steep slopes is a natural constraint. Dunes present a special problem for the developer and the municipality. Left unvegetated the dunes offer poor support for roads and structures. To allow the dunes to be leveled may result in substantial protest from townspeople who consider the dunes part of their heritage. The soundside dunes are a unique geological formation. The ocean dunes are regarded as a complete constraint which cannot be lifted by the Town since they are an area of environmental concern. However, almost all property owners who own oceanfront lots should be able to build on their land in historically acceptable manner despite the regulations. Thus, soundside dunes may be considered a constraint. Primary dunes are a constraint but we do not anticipate any land being lost to development.

Woodlands: Forests improve the macro-climate and are a major balancing effect upon the water regimen--diminishing erosion, sedimentation, flood and drought. The scenic role of woodlands is apparent, as is their usefulness as a habitat for game and plant life. Woodlands offer substantial potential for recreational use. The forest is a low maintenance, self-perpetuating landscape. Forests can be employed for timber production, water management, wildlife habitats and recreation. Although we have not considered all wooded land as a constraint in our model, we have constrained the Nags Head Woods restricting it to development entirely in one run of the model. The Woods offer a rather unique environment (see AEC Study). Current regulations restrict development to approximately one unit per acre. This decreases the allowable development by 2.7 times.

Zoning: Zoning is not a constraint in Nags Head except in the Woods. All other areas have lower allowable densities than have been used historically to build on.

Note: In using the maps to measure the land constrained under several constraints, it is important to avoid double accounting. Once a land area is removed from development from the application of one constraint, it cannot be counted as removed from the application of a second constraint. This is a particularly difficult concept when working with concepts such as zoning.

TABLE 1  
STANDARDS FOR LAND USE PROJECTIONS

Land Use		Land Consumed (acres/person)
Residential	Single family	.094
	Townhouse	.038
	Cottage court	.029
	Motel	.016
Commercial		.0022
Institutional		.0026
Recreational		.0032

In developing the above standards, residential uses were descriptive of the actual situation. In handling other uses, we consulted national standards and used our experience from similarly situated communities. In handling recreational use we used standards developed for ocean beaches by Ron Johnson, namely .00016 for beach access, .003 for public parks and open space.

TABLE 2  
EXISTING LAND USE (1980)

Land Use		Land Consumed* (acres)
Residential	Single family	620
	Townhouse	20
	Cottage court	85
	Motel	55
		780
Commercial		105
Institutional		5
Recreational		6
Transportation		90
Other		199
Total		1185

\*Land that should have been consumed.

TABLE 3  
LAND REQUIRED IN 1990 (LOW DENSITY)

Land Use		Land Consumed (acres)	
Residential	Single family	1998.4	
	Townhouse	97.9	
	Cottage court	112.1	2280.6
	Motel	72.2	
Commercial*			70.9
Institutional*			83.8
Recreational*			103.1
Transportation			253.8
Total			2792.2
Additional acres required			1806.2

TABLE 4  
LAND REQUIRED IN 1990 (MEDIUM DENSITY)

		Land Consumed (acres)	
Residential	Single family	1514.0	
	Townhouse	306.0	
	Cottage court	46.7	1969.8
	Motel	103.1	
Commercial*			70.9
Institutional*			83.8
Recreational*			103.1
Transportation			200.5
Total			2499.0
Additional acres required			1513.0

TABLE 5  
CARRYING CAPACITY WITH PRESENT CONSTRAINTS

Land Use Constraint		Land Constrained (acres)*	
Developed land	1185 acres		
Roads	119		
Jockey's Ridge	280		
Wetlands	375		
Zoning in Woods (SPD40)	180		
Total constrained		2139	
Acres available for development			2488
 <u>Scenario #1:</u>			
Constrain Nags Head Woods and soils unsuitable for on-lot sewage disposal and within 1000 feet of sound.			
Nags Head Woods	860		
(of 1080 acres in Woods over 220 are wetlands and 180 zoning)			
Unsuitable soils (1000')	705		
Total		3524	
Acres available for development			1103
 <u>Scenario #2:</u>			
Constrain dunes and all soils unsuitable for on-lot sewage disposal.			
Total constrained		3679	
Acres available for development			948
 <u>Scenario #3:</u>			
Constrain of on-lot sewage lifted and public sewer built			
Total persons that can be served			[17,500 persons]

\*Total Area of Town: 4150 acres.

Comment

Nags Head can accommodate its 1990 growth under an extension of its present constraint system. Those constraints include currently developed land, state roads, Jockey's Ridge, wetland and a lower capacity for the Woods. Accordingly in 1990, the Town will be 50% developed. Furthermore, the Town can adopt an interim policy on not developing on soils unsuitable for septic systems within 500 feet of the sound without really affecting its ability to meet growth. When public sewers are available, this constraint could be removed leaving over 2000 acres available for development. The extension of a constant growth rate met heavily through single family home development will however result in the Town being fully developed by 2000. The Town can anticipate strong pressures for redevelopment during the mid to late 1990s.

Several technical aspects limit the capacity of the Town at this time: one is the water system which is at capacity (see Environmental Considerations); another is the bridge and transportation system which is at or near capacity (see Transportation System); another will or may be the sewer system, when and if it is built.

Poor soils are not a constraint to meeting the population demand for new housing to 1990.

**SECTION THREE: DESCRIPTION OF EXISTING PLANS, POLICIES AND REGULATIONS**

**Chapter I.            Current Plans and Implementation**

**Chapter II.          Policies from 1976 Land Use Plan**

**Chapter III.        Land Use Compatability**

## CHAPTER I

CURRENT PLANS, POLICIES AND REGULATIONS

Nags Head has adopted the following plans:

NAGS HEAD LAND USE PLAN (1976)

Comprehensive land use plan updated in this planning process. Several chapters have detailed information, still applicable, but not included in this update; particularly resident population characteristics (age, sex, income) and economic data on same (employment commuting patterns, retail sales). The 1980 Plan focused on more detailed information on seasonal population, growth rates, housing densities and use, revenue and facility, implications from growth, soil unsuitability for septic systems, water quality in the Roanoke Sound, hurricane evacuation capacity and problems. These documents are highly complimentary. The 1976 Plan was prepared by N.C.D.N.R.C.D.

NAGS HEAD LAND DEVELOPMENT PLAN (1972)

Predecessor of the 1976 Plan. This Plan designates future land use areas for varying uses and densities of use.

NAGS HEAD-KILL DEVIL HILLS THOROUGHFARE PLAN (1972)

The Thoroughfare Plan outlines future plans to accommodate growth on the road system, particularly plans for a six-lane highway and design of major intersections. Prepared by N.C.D.O.T.



BEACH ACCESS PLAN, NAGS HEAD (1979)

Inventory and analysis of beach access points. Concluded that Town needed 11 more access points and that most of existing access points needed improvements (for parking and "support" facilities).

ENGINEERING REPORT: IMPROVEMENTS OF THE WATER DISTRIBUTION SYSTEM FOR THE TOWN OF NAGS HEAD (1978)

Analyzed several alternatives for improving capacity of existing water system. Alternative B, calling for ground reservoir at Whalebone Jct. and 24" line sizes on main lines are principal features. Prepared by Williams and Works.

DARE COUNTY COMPLEX 201 FACILITY PLAN (1977)

Study of feasibility of a regional sewer system to serve Manteo and the Dare Beaches. Alternative A was selected by all participants. Prepared by Van Oessen Associates.

Nags Head had adopted the following implementation devices:

ZONING ORDINANCE (1977)

Revised in 1977, the ordinance addresses densities, height, uses, etc.

SUBDIVISION ORDINANCE (1971)

Established standards for subdividing land. Requires developers to install streets and utilities.

SOIL EROSION AND SEDIMENTATION CONTROL ORDINANCE (1975)

Requires an erosion control plan for land disturbing activities.

DUNE PROTECTION ORDINANCE (1971)

Requires 150 foot set back from mean high water on Atlantic Ocean.

N.C. BUILDING CODE

Requires buildings meet State building standards.

FLOOD HAZARD ORDINANCE (1975)

Established flood hazard boundaries and set development standards.

In addition, the County requires all development relying on septic tanks under 3000 gallons to obtain a septic tank permit from the Dare County Health Department.

In addition, the Coastal Resources Commission and Department of Natural Resources and Community Development administer and enforce the CAMA permit for development within areas of environmental concern. The Nags Head Building Inspector, who administers most ordinances for Nags Head, is the local CAMA permit officer.

The following reports are being completed:

MANAGEMENT SYSTEM FOR NAGS HEAD WOODS (1980)

A study of the Woods, reviewing existing information, mapping constraints and analyzing the existing management system. The report proposes a new system similar to Sanibel or Adirondack Park Systems. Prepared by Coastal Consultants, Ltd.

SURFACE WATER DRAINAGE PLAN (1980)

Addressed surface drainage problems in Nags Head and analyzes technical improvements to eliminate the problem. McDowell-Jones and Associates; Coastal Consultants, Ltd.

## CHAPTER II

### POLICIES FROM 1976 LAND USE PLAN

1. Preserve and enhance qualities unique to Nags Head, such as slow pace of life, freedom from pollution and urban pressures, the natural environment of the Outer Banks and inaccessibility of the Town.

2. Provide for the development and expansion of the tourist industry.

- A. Reinforce family beach atmosphere.
- B. Extend tourist season
- C. Provide public access for land locked property owners
- D. Develop commercial services park
- E. Encourage building of vacation homes

3. Coordinate growth policies with adjacent municipalities and Dare County

- A. Develop regional water and sewer system
- B. Implement Thoroughfare Plan

4. Conserve air, water and land resources and preserve natural environment

- A. Prevent development from altering wetlands, frontal dunes, beaches, estuarine and surface waters, wildlife habitats, natural areas
- B. Prevent development from being endangered by flooding, erosion, inlet migration

- C. Prevent development from reducing value of parks and aquifers.

5. Provide for orderly growth of Nags Head as year round community.

- A. Require development to locate on stable, well drained soils with a low water table
- B. Require structure to locate on sites so as to avoid destroying existing vegetation and land form wherever possible
- C. Require development to minimize interference with established patterns of surrounding land use
- D. Require development to be located and timed to make most efficient and economical use of public services
- E. Require permanent neighborhoods to keep low density and large open space
- F. Require seasonal residents to locate with convenient access to transportation routes and recreational activities
- G. Require development to meet County septic tank regulation
- H. Require development in excess of 3 units per acre to be served by public or community sewer

6. Commercial development should be concentrated in groups of complementary uses. They should have sites large enough to provide ample parking, controlled access and buffers to residential use.

7. Water related commercial activity should be located in naturally protected areas as near deep water as possible and where least alteration of marsh or estuarine bottom is required.

8. Industry not dependent on waterfront should locate elsewhere.

### CHAPTER III

#### LAND USE COMPATIBILITY

##### Significant Land Use Compatibility Problems

The Town of Nags Head does not have any significant land use compatibility problems. The attitude towards segregating commercial and residential has lost much of its significance. The Town zoning ordinance requires commercial developers to erect a buffer from already existing residential units. Thus, noise, lights and other offensive characteristics have been shielded from residential uses. Industrial operations near Town Hall are not expected to continue for a significant period of time. This use could pose conflict with residential use; however, presently only a few structures are close enough to be annoyed.

##### Major Problems From Unplanned Development

Overzoning. Residents and property owners in the Town did not feel that too much land was zoned for commercial use (see Questionnaire). The Town has significantly reduced the amount of land in the commercial zone; also, some of the areas zoned commercial has actually developed as single family residential. The Town's zoning ordinance encourages centralizing commercial development. One of the more recent commercial developments was a shopping plaza. We should note that the bypass in Nags Head is only lightly developed with commercial development and even this development is in pockets (see existing land use map). Restaurants, heavy auto users at select times of day, are predominantly located with other commercial

development which acts as buffer for this use and the residential community.

Town policies on frontage, setbacks, etc. for commercial property should correct ill effects from commercial development on the bypass.

#### Other Defects.

(1) Lack of local collectors (streets) to move traffic short distances without resorting to the bypass or beach road. A need to connect roads west of the bypass (see policy on connecting the Soundside Road to Cove subdivision).

(2) Need to allow reasonable ingress and egress for residents and property owners of Nags Head Woods. Also, need to provide means for taking emergency vehicles through this area (see policy on Woods road).

(3) Surface drainage problems (see surface drainage study prepared this year; also, policies).

Many of the Town's other problems may have some relationship to poor planning by some layer of government.

#### The Areas Likely to Experience Change

Areas most likely to experience change are: (1) South Nags Head will continue to fill in the several undeveloped tracts; (2) already subdivided areas will fill in, especially in new subdivisions west of the bypass; (3) a considerable amount of development will probably occur on the mile long unsubdivided property surrounding Town Hall and reaching from ocean to sound.

The Town should not expect a significant change in densities or use of motels over the recent past. Redevelopment seems unlikely within the planning period because of the considerable excess capacity for growth.

(For more details see Carrying Capacity and Population chapters where land used and land available is determined and where the population and

housing mix are projected and analyzed.)

## CHAPTER IV

## LAND CLASSIFICATION

Established: The purpose of the developed class is to provide for intensive development and redevelopment of existing urbanized areas. Areas to be classified as developed include lands currently developed for urban uses at or approaching a density of 500 dwellings per square mile that are provided with usual municipal services including at least public water, sewer, recreational facilities, police and fire protection. In the Town of Nags Head, the developed class has been subdivided into an established class to reflect a situation where the Town has services listed above, except for public sewer. The Town is currently involved in studying the feasibility of public sewer under the Regional 201 Facilities Plan. The area in the Town classified as established is located between the ocean and the U.S. 158 By-Pass. However, there are several established subdivisions west of the By-Pass (see classification map).

Transition: The purpose of the transition class is to provide for future intensive urban development within the ensuing ten years on lands that are most suitable and that will be scheduled for provision of necessary public utilities and services. The transition lands also provide for additional areas when lands in the developed class are not available or when they are severely limited for development. In the Town of Nags Head, all lands not classified as established,



conservation or conservation use are transition.

Conservation Use: Conservation Use areas are those areas having significant environmental resources deserving of protection, but where the protection required, considering such factors and land patterns, development costs, land values, etc., is such that limited development is appropriate. In these areas the Town favors cluster development and low density. Generally this area coincides with the boundaries of the Nags Head Woods.

Conservation: The purpose of the conservation class is to provide for effective long term management of significant limited or irreplaceable areas. This management may be needed because of its natural, cultural, recreational, productive, or scenic values. These values should not be identified as transition in the future. In the Town, lands classified as conservation include all AEC areas. Such areas would be the ocean hazard area, estuarine shoreline, coastal marshes, and all surface waters.

#### RELATIONSHIP OF POLICIES AND LAND CLASSIFICATION

Established: In this class, present uses include a combination of urbanized uses (e.g. high, medium and low density residential; commercial, transportation, and institutional). It is the policy of the Town to maintain existing growth and provide development opportunity to allow for increased tourist economy. The zoning in the established class segregates commercial and high density uses along portions of the oceanfront and By-Pass. Several of the high density developments operate with package waste treatment systems.

Residential development has been at moderate densities and has considered soil limitations, so that considering the small number of canal lots and the existence of public water, it does not pose a problem.

Transition: Almost all of this classification is presently platted for residential development. These areas are expected to accommodate the urbanized population and economic growth through the planning period. Sewer is not absolutely necessary to the development of this area.

Conservation Use: This area is intended for protection through low density development. Such a development scheme should implement the policies and proposed management practices for the Nags Head Woods.

Conservation: The purpose of the conservation class is to provide for effective long term management of significant limited or irreplaceable areas. This management may be needed because of its natural, cultural, recreational, productive or scenic values. In the Town, this class applies to all AEC areas, which include the ocean hazard areas, estuarine shoreline, coastal wetlands, and all surface waters. The Town supports CAMA regulations in applying standards for these areas. The Town allows plowing to create dunes, but does not support beach nourishment procedures or the establishment of groins or jetties. The Town allows bulkheading on the estuarine shoreline. The Town allows the construction of walkways and platforms over the frontal dunes as long as public access is not interfered with.

#### SECTION FOUR: APPENDIX

Chapter I.	Federal and State Licenses and Permits
Chapter II.	Nags Head Questionnaire
Chapter III.	Public Participation Element
Chapter IV.	Executive Policy Summary

## STATE LICENSES AND PERMITS

Agency	Licenses and Permits
Department of Natural Resources and Community Development Division of Environmental Management	<p>--Permits to discharge to surface waters or operate waste water treatment plants or oil discharge permits; <u>NPDES</u> Permits, (G.S. 143-215)</p> <p>--Permits for septic tanks with a capacity over 3000 gallons/day (G.S. 143-215.3).</p> <p>--Permits for withdrawal of surface or ground waters in capacity use areas (G.S. 143-215.15).</p> <p>--Permits for air pollution abatement facilities and sources (G.S. 143-215.108).</p> <p>--Permits for construction of complex sources; e.g. parking lots, subdivisions, stadiums, etc. (G.S. 143-215.109).</p> <p>--Permits for construction of a well over 100,000 gallons/day (G.S. 87-88).</p>
Department of Natural Resources and Community Development Office of Coastal Management	<p>--Permits to dredge and/or fill in estuarine waters, tidelands, etc. (G.S. 113-229).</p> <p>--Permits to undertake development in Areas of Environmental Concern (G.S. 113A-118). NOTE: Minor development permits are issued by the local government.</p>
Department of Natural Resources and Community Development Division of Earth Resources	<p>--Permits to alter or construct a dam (G.S. 143-215.66).</p> <p>--Permits to mine (G.S. 74-51).</p> <p>--Permits to drill an exploratory oil or gas well (G.S. 113-381).</p>

Agency	Licenses and Permits
Department of Natural Resources and Community Development Secretary of NCRD	--Permits to conduct geographical exploration (G.S. 113-391).
	--Sedimentation erosion control plans for any land disturbing activity of over one contiguous acre (G.S. 113A-54).
	--Permits to construct an oil refinery.
Department of Administration	--Easements to fill where lands are proposed to be raised above the normal high water mark of navigable waters by filling (G.S. 146.6(c)).
	--Approval to operate a solid waste disposal site or facility (G.S. 130-166.16).
Department of Human Resources	--Approval for construction of any public water supply facility that constitutes a community water source (G.S. 130-160.1).

## FEDERAL LICENSES AND PERMITS

Agency	Licenses and Permits
Army Corps of Engineers (Department of Defense)	<p>--Permits required under Sections 9 and 10 of the Rivers and Harbors of 1899; permits to construct in navigable waters.</p> <p>--Permits required under Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972.</p> <p>--Permits required under Section 404 of the Federal Water Pollution Control Act of 1972; permits to undertake dredging and/or filling activities.</p>
Coast Guard (Department of Transportation)	<p>--Permits for bridges, causeways, pipelines over navigable waters; required under the General Bridge Act of 1946 and the Rivers and Harbors Act of 1899.</p> <p>--Deep water port permits.</p>
Geological Survey Bureau of Land Management (Department of Interior)	<p>--Permits required for off-shore drilling.</p> <p>--Approvals of OCS pipeline corridor rights-of-way.</p>
Nuclear Regulatory Commission	<p>--Licenses for siting, construction and operation of nuclear power plants; required under the Atomic Energy Act of 1954 and Title II of the Energy Reorganization Act of 1974.</p>
Federal Energy Regulatory Commission	<p>--Permits for construction, operation and maintenance of interstate pipelines facilities required under the Natural Gas Act of 1938.</p>

Agency	Licenses and Permits
	<ul style="list-style-type: none"><li>--Orders of interconnection of electric transmission facilities under Section 202(b) of the Federal Power Act.</li><li>--Permission required for abandonment of natural gas pipeline and associated facilities under Section 7C(b) of the Natural Gas Act of 1938.</li><li>--Licenses for non-federal hydroelectric projects and associated transmission lines under Sections 4 and 15 of the Federal Power Act.</li></ul>

## C. PUBLIC PARTICIPATION PROGRAM

### INTRODUCTION

Public participation is necessary for effective land use planning. Since land use planning affects a wide range of economic, social, environmental and institutional interests, it should be carried out and implemented in a manner which meets public satisfaction. When properly developed, public participation in the planning process facilitated the identification of local issues and public preferences and fosters the evaluation and development of management alternatives.

Public participation is required by the North Carolina Department of Natural Resources and Community Development for land use planning under the Coastal Area Management Act. The Land Use Planning Guidelines (15 N. C. A. C. 7B .0207) state: "Local governments are encouraged to employ a variety of participation techniques to assure that all segments of the community have a full and adequate opportunity to effectively participate in planning decision-making.

The public participation program must be as carefully scheduled and timed as the technical program, with specific activities keyed into particular stages of the technical program. Thus, under such a public participation program, by the time preliminary plan alternatives are developed, more widespread response and more intelligent reaction can be anticipated.

### OBJECTIVES AND APPROACH

#### A. Objectives:



The public participation program is designed as an integral part of the planning process. The following objectives are to be strived for during the planning process:

- (1) to develop an understanding among citizens and the organized private interest in the community of the principal physical problem and needs of the area and the role of planning in dealing with them and bringing about a more liveable environment.
- (2) to cultivate the practice among civic leaders and organization of sharing in the planning process, from the earliest stages to review of the final plan.
- (3) to provide media for reporting on planning studies and recommendations so that civic action programs have the benefit of studied analysis of the community's problems and needs.
- (4) to overcome the lack of, or problems of, established political mechanisms so as to reach segments of the population not adequately represented in the planning and decisionmaking process.
- (5) to communicate the concerns of interested citizens.
- (6) to continue to build public confidence in the planning process.
- (7) to continue to find ways to inform the public of plans, policies, regulations and problems.
- (8) to reflect changes in the public perception of their area, its needs and resources, and the best use of these resources.
- (9) to improve compliance with the planning program.
- (10) to continue to disseminate and make readily available information that can lead to better land use decisions.

### B. Approach:

The approach of the public participation program is to combine an educational process with issue raising sessions, questionnaires and public meetings. In order to assure participation of appropriate groups, a sector analysis will be prepared to determine what publics exist and their relative makeup of the community's population.

These groups need to be supplied with background information on the basis for planning in the area. They should be given sufficient lead time, before input is needed, to review relevant information.

### DETERMINATION OF PUBLICS

It is important to recognize, in reference to land use planning, that there are many sectors of the public which vary in the time they spend in the community, their degree of participation in the political process, their importance to the community, and the interest group with which they must identify.

Some of these groups are listed below:

#### Groups Arranged by Political Input

- A. Permanent residents who participate in the governmental process;
- B. Temporary residents (summer inhabitants, monthly and weekly residents)
- C. Day users (close and remote)
- D. Interested non-residents (absentee landowners and others)
- E. Permanent residents who do not participate in the governmental process.

### Interest Groups

- |                             |                                |
|-----------------------------|--------------------------------|
| A. General Public           | I. Vicarious Users             |
| B. Builders and Contractors | J. Low Income Persons          |
| C. Realtors and Developers  | K. Retirement Persons          |
| D. Commercial Businessmen   | L. Farmers                     |
| E. Commercial Fishermen     | M. Tenant Farmers and Laborers |
| F. Sport Fishermen          |                                |
| G. Beach Users              | N. Industry                    |
| H. Government Workers       | O. Military                    |
|                             | P. Civic Groups                |

During a planning board work session, the board was asked to weight each of the groups by percentage of population and degree of influence. Through this process a list of publics was prepared.

#### A. Forum:

A public forum was held with specific invitations to various interest groups in the community. The first part of the forum was educational; the second part sought to elicit community issues and problems.

#### B. Meetings of Governmental Bodies:

The planning process has been developed through the thoughtful presentation of planning material and the discussion and reaction of members of the planning board and the public. All meetings are open to the public and advertised in the papers. In addition the progress of the planning board has been reported regularly to the elected officials at their regular, public meetings.

PUBLIC INPUT

## A. Planning Board:

During the first planning board meeting, the various publics were identified and weights were given to each group. Names and addresses were determined through a selective random sampling procedure designed to reach at least some members from each group. These persons were directly invited to participate in the issue forum. In addition, public notice of the forum was placed in the newspapers and on community bulletins of local radio stations.

## B. Issue Forum:

The first part of the issue forum was educational. The second part was designed to elicit planning issues from the community. These issues were used to design the informational questionnaire which helped feed the decisionmaking process. In order to determine community issues, the Nominal Group Method was selected to elicit responses.

## C. Nominal Group Method:

The Nominal Group Method works as follows: The process begins when an elected official or member of the planning board welcomes the citizens of the community to the forum. The official will explain the meeting's purpose (to solicit citizen's ideas about community problems, goals and objectives). No attempt will be made at this time to arrive at solutions during the meeting.

Thereafter the participants are given a sheet of paper with the questions to be addressed. Such as, "In your opinion, what are the development problems needing attention over the next few years? What suggestions do you have to plan for the future of the area? What should

the municipality look like in the next 10 years? At this point an identifiable example from a different situation indicating the type of responses desired (problems, not symptoms or solutions) will be shared with the audience.

The citizens will then be divided into subgroups of five to ten people each. The subgroup members will be instructed to work individually and silently on compiling a key word list of problems facing the community. Participants who finish early will be encouraged to review their list for other possibilities. After individuals are given about a half-hour to compile this list of problems a recorder will join each subgroup and ask each individual in a round-robin fashion for one of his statements of community problems. The recorder will write each participant's statement verbatim on a flip chart. No debate, rewording or combining of items will be allowed. The purpose of this phase is to get as many ideas as possible listed without the immediate burden of their defense.

This process will continue until each member in the subgroup has the opportunity to enumerate all of his concerns. After this tabulation is completed, participants will be allowed to mingle and discuss among themselves the issues that were raised in the various subgroups. The subgroups will then be reformed so that a clarification of the issues may be accomplished. Throughout this phase, the role of the recorder is to minimize personalities entering the discussion and to keep a focus on the issues.

After a few minutes of clarification, the participants will be asked to vote silently and privately on the five most important issues

before their subgroup. The voting will be done by setting weights on the problems selected (the most important item will be given a weight of five (5)). The votes will be collected and a tally made for that subgroup. After each subgroup compiles its priorities, the information is reported to the main group. Following a brief discussion of the results, the citizens are notified of the use of their concerns in policy settling. No statement of proposed outcomes should be made at this point in the process to prevent false expectations of potential courses of action.

Use of the nominal group process in setting community goals and objectives may help reduce adverse reaction frequently associated with land use planning. It may help citizens to feel that it is their plan. They will know what it contains and they will be familiar with its purpose. Thus, they may be more willing to support future management tools based upon the guidelines set forth in the plan. It is important to recognize that land use planning involves the resolution of conflicts among people about what the best uses of the land are.

Having determined pertinent issues from the forum, these issues will be discussed with the planning board. A questionnaire will be developed to ascertain public attitude and opinion on the issues. The questionnaire will be completed by telephone interview with attendees of the issue forum and persons selected by random sample from the voter registration lists. The results of the questionnaire will be tabulated and used by the planning board to develop tentative goals, objectives and policies. At each stage of the technical planning process, the forum attendees will be asked to continue to participate as an informal advisory group to the planning board.

LAND USE PLAN UPDATE FOR

THE TOWN OF NAGS HEAD

1980 - 1990

EXECUTIVE SUMMARY

The Nags Head Land Use Plan addresses land use related problems currently facing the Town and those anticipated during the next ten years. Although it is not technically a comprehensive land use plan, the plan is comprehensive in scope. The plan was undertaken to examine in as technical a manner as possible a number of subject areas of concern to the Town, particularly population, environmental systems and constraints, housing alternatives, transportation problems and carrying capacity. The technical information served as a basis for the formulation of the policy section, which is in itself the best summary of the land use plan.

The primary purpose and use of the Nags Head Land Use Plan is to govern local decisions concerning land use related issues. The land use plan has several secondary purposes including to guide federal and state officials in making decisions that effect the Town and which involve the use of the land.

This summary is a fairly accurate representation of what is in the land use plan. The user of the executive summary is cautioned against quoting the policies without consulting the policy section. Certainly a full understanding of the policy section is not possible without reading in detail the technical sections used to formulate policy. Furthermore, it should be noted that the land use plan is flexible. Additional sections will be added as the Town addresses new issues. These studies will shape policies; and the policy section will be rewritten. However, in all likelihood this executive summary will remain the same.



1. It is the Town's policy that the anticipated growth to the year 1990 is welcomed and that the Town will plan and provide adequate services necessary to meet the demands of that population.
2. It is the Town policy that major improvements should be made to the water distribution system to allow it to deliver the water available from the Regional System and to accommodate expected growth to 1990.
3. The Town supports efforts to improve quality in the Sound. It is opposed to further deterioration in water quality of the Sound. The Town supports efforts initiated by the former Dare Beaches Water & Sewer Authority and its contractor, Henry Von Desen & Associates, Consulting Engineers and Planners to study the feasibility of several package treatment systems to be located on future subdivisions which have a high percentage of unsuitable soils.
4. The Town will serve areas under the following scheme of priorities: areas with poor soils close to the Sound will be served first, then areas with poor soils, then heavily populated areas, then other areas. Nags Head places the lowest priority to extending public sewer mains to the environmentally sensitive Nags Head Woods, to wetland areas and other areas which are designed for light population levels provided the soils in these areas are adequate to take care of approved development levels.

5. The Town believes that a decision on whether to support a single regional wastetreatment system for the beaches or to support the building of several small package facilities within problem areas of the Town should be made within the next 48 months.
6. The Town adopts a policy of requiring future subdivisions to design areas nearest the Sound or other estuarine water with generous setbacks for septic systems and with large lots and lot width to accomplish the lowest practical density (Environmental Considerations, p. 12). The Town supports a policy of future subdivisions utilizing a minimum one acre lot size for lots within 500 feet of the Sound.
7. The Town supports the building of another two or three lane bridge system from the Barrier Islands to the mainland.
8. The Town believes that unless additional capacity to evacuate 60,000 additional people is provided by 1990 that all municipalities on the Outer Banks, together with the U.S. Park Service, should take measures to limit growth.
9. Nags Head recommends that Dare County revise its current Hurricane Evacuation Plan (published August 14, 1980) to address the issue of restricting the movement of accident-prone vehicles on the bridges leading from the Barrier Islands.

10. The Town supports the Department of Transportation Thoroughfare Plan's proposal to multi-lane the Bypass roadway (it specifically incorporates the plan into the Land Use Plan). In the event that the entire multi-laning project could not be completed at one time, the Town supports actions that would multi-lane parts of the Bypass, even if the first sections to be paved were in Kill Devil Hills.
11. The Town supports other construction alternatives which would preserve the objectives of the Thoroughfare Plan.
12. The Town favors the continued use of the beach road as a local collector.
13. The Town favors a road in the Nags Head Woods that will utilize, to a large extent, the old roadbed and can be built with a below normal right-of-way and a minimum amount of pavement.
14. It is the Town policy to protect the mature vegetation along and near the ridge in the Nags Head Woods.
15. The Town favors Soundside Road being connected with the Old Nags Head Cove subdivision.
16. The Town supports interim of permanent measures to alleviate traffic congestion on the Bypass, provided such action does not

result in increasing the level of speed or amount of traffic on the beach road, or result in another Bypass along the Sound.

17. The Town supports the construction of a two lane bridge from the northern limits of Nags Head or the southern limits of Kill Devil Hills to Roanoke Island.
18. The Town shall take and continue to take numerous nonconstruction alternatives to relieve congestion on the Bypass. The Town shall continue to seek to cut back on the amount of commercially zoned area on the Bypass.
19. The Town shall study the possibility of restricting permitted commercial development along the Bypass to only those types which do not generate substantial amounts of traffic.
20. The Town shall, through zoning district amendments (to boundaries of districts), encourage commercial development to locate in commercial parks rather than in strips along the Bypass.
21. The Town shall study the feasibility of requiring deep setbacks for buildings from the Bypass right-of-way; it will also consider standards for the design of parking lots so as to decrease the time required to exit from the Bypass.
22. The Town shall encourage commercial development to exit into streets other than the Bypass where such options exist.

23. The Town will discourage the number of entrances and exits to and from the Bypass.
24. The Town shall encourage businesses with complementary uses to share common parking facilities.
25. The Town shall limit the number of new streets entering the Bypass.
26. The Town will foster a policy of providing public transportation to the beaches and commercial establishments for its residents and visitors.
27. Nags Head shall place a higher priority during the next ten years on paving local roads. In setting priorities, the Town will consider whether the road is likely to encourage development on lots with poor soils for septic systems.
28. The Town supports the continuation of federal flood insurance policies.
29. It is Town policy to be consistent with policies and standards of the Coastal Resources Commission for areas of environmental concern.
30. The Town desires to provide additional protection to the frontal dune system and to property owners relying on that system for

protection. The Town shall implement this policy by encouraging all property owners of lots containing frontal or primary dunes to fill in beaches, rebuild low spots, revegetate barren areas, build walkways over the dunes and avoid other actions that could weaken the protective nature of the dune system.

31. The Town fosters a policy of encouraging future motel and commercial development constructed of steel and concrete to locate west of the beach road.
32. It is Town policy that no person or legal entity be permitted to build a seawall, jetty, groin or other artificial device designed to stabilize the ocean shoreline.
33. The Town shall increase the amount of open space along the ocean-front by increasing the amount of open space required in exchange for allowing higher densities on parts of the property and greater building heights.
34. It is Town policy to provide adequate recreational opportunities, particularly beach access and parking for use of the ocean beaches and sounds for all residents of the Town.
35. In the event that the plans for providing public transportation for persons living west of the Bypass to the beach do not prove feasible or otherwise acceptable, the Town will provide beach parking areas for the use of persons who cannot reach the beach by walking or

mass transit.

36. The Town also believes that open space should be provided for environmental protection in addition to open space for recreation.
37. The Town accepts as a public responsibility the provision of access for recreation to the Sound.
38. It is Town policy to encourage a housing mix that is heavily single family. In environmentally sensitive areas the Town encourages higher density development of less sensitive lands in order that the more sensitive lands be left in open space.
39. The Town encourages the preservation of historic areas. The Town will consider the adoption of a zoning ordinance amendment, pursuant to authority granted by N.C.G.S. 160A-395, to designate the area as an historic district.
40. The Town calls on the State Department of Transportation to engineer, design and build storm surge culverts to allow movement of water under the Bypass.
41. The Town is opposed to the building of new finger canal systems.
42. The Town feels that appropriate uses within the Town's AEC's shall be those set out in the AEC's by the Coastal Resources Commission, except where more stringent restrictions have been placed on

development by the Town through its zoning regulations or subdivision controls. The Town supports the efforts of local residents and property owners who have attempted to stabilize the dune system by doing sand pushing and vegetation.

43. It is the policy of the Town of Nags Head to protect from development as much as is possible the unique and natural features in the Nags Head Woods. It is also Town policy to respect the rights of those persons who own land in the Woods to have a reasonable and practical use of their property, including a reasonable rate of return.
44. The Town is particularly interested in protecting those features which if not protected would result in the loss of the Woods as a unique natural area.
45. The Town proposes to adopt district zones that conform to the natural boundaries of the elements of the total system that makes up the Woods and to prescribe an appropriate development density for each zone.
46. The Town is opposed to energy facilities, including pipelines, docking facilities and plants, locating anywhere within the Town's jurisdiction.
47. Nags Head is opposed to commercial or non-commercial cutting of the Nags Head Woods timber and to mining activities there.



48. The Town feels that commercial fisheries uses within the Town are incompatible with other uses in the Town.
49. The Town will continue to provide a strong citizen participation program for the future.
50. The Town has a policy of cooperating with other municipalities on the Dare Outer Banks, with the County, State and Federal government in pursuing all the aforementioned policies.

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